- A new mechanism of alkaline pulping
- A continuous jet cooker
- Waste paper and changing papermaking fibers
- Automation at Racquette
- Polyethylene in paper

The Paper Industry

CHECK CHART of Nalco®

PRODUCTS and SERVICES for the PAPER INDUSTRY

FROM raw water through final recovery, Nalco chemicals and services help produce better pulp and paper products...speed processing...save time and money. Details on the chemicals and services outlined here are contained in Nalco Bulletin 55. Write for your copy today—or ask your Nalco Representative for answers to your problems.

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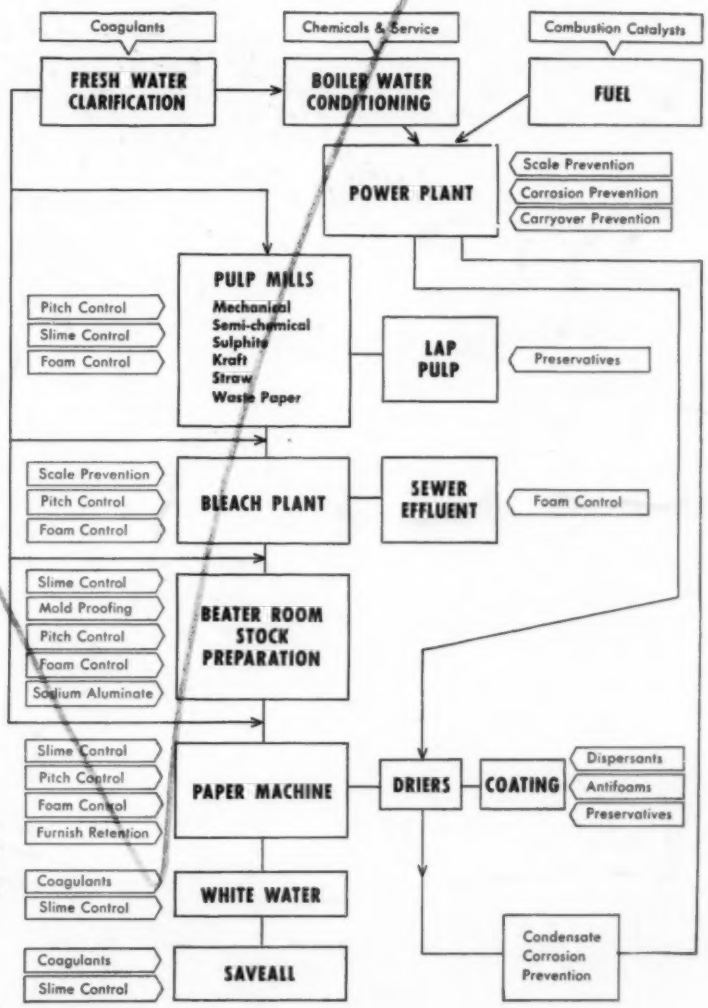


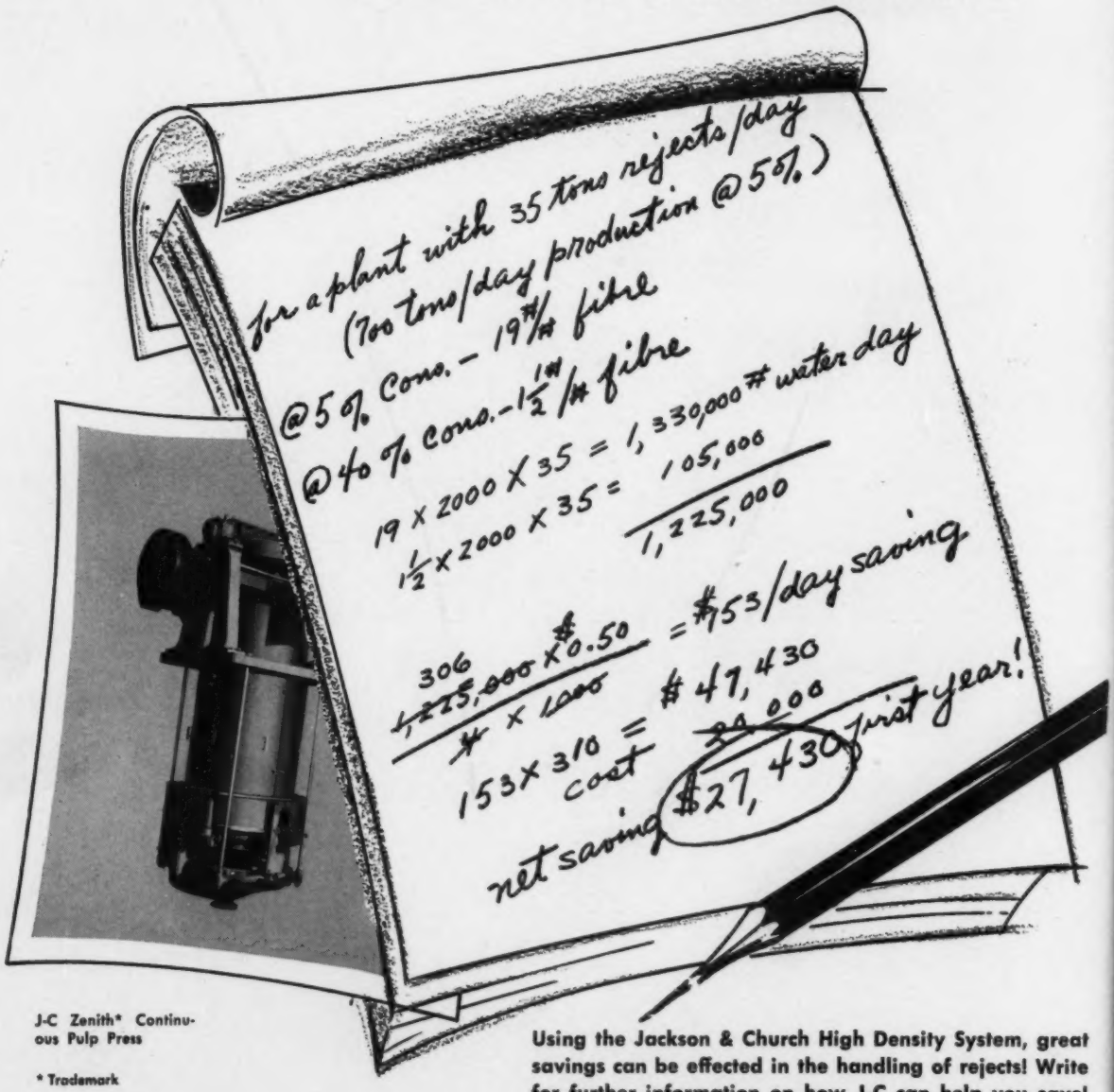
THE Nalco SYSTEM • Serving the Paper Industry through Practical Applied Science

EVAPORATORS OVERLOADED?

SHORT OF STEAM?

Rejects put back into the system at low consistency can be the cause of the trouble!

Many plants are now solving this problem simply and efficiently by using a Jackson & Church High Density System. Here is what this can mean to you in dollars-and-cents savings . . .


for a plant with 35 tons rejects/day
(700 tons/day production @ 5%)
@ 5% Cons. – 19#/# fibre
@ 40% Cons. – 1½#/# fibre
19 × 2000 × 35 = 1,330,000 # water day
1½ × 2000 × 35 = 105,000
1,225,000
306
1,225,000 × $0.50 / # × 1000 = $153/day saving
153 × 310 = $47,430
cost 30,000
net saving $27,430 first year!

J-C Zenith* Continuous Pulp Press

* Trademark

Using the Jackson & Church High Density System, great savings can be effected in the handling of rejects! Write for further information on how J-C can help you save!

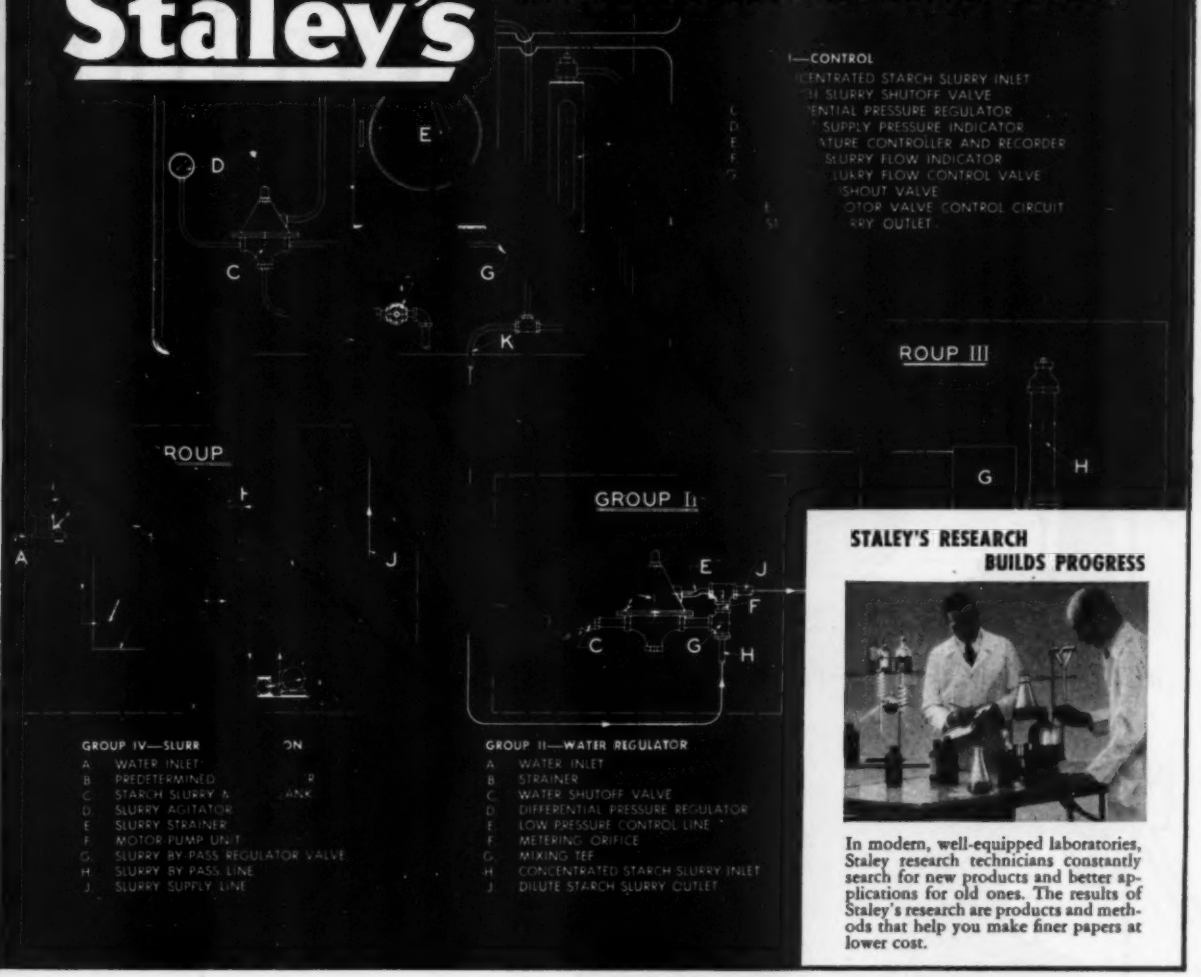
J-C

JACKSON & CHURCH CO. SAGINAW, MICHIGAN

Work well done since eighty-one

Staley's

® BETTER PRODUCTS FOR BETTER PAPERS



STALEY'S RESEARCH BUILDS PROGRESS

In modern, well-equipped laboratories, Staley research technicians constantly search for new products and better applications for old ones. The results of Staley's research are products and methods that help you make finer papers at lower cost.

Now! A new Staley development for paper makers—a jet cooker for continuous wet end addition of starch!

New Staley Jet System revolutionizes starch preparation and application . . . cuts costs

NOW! After years of development and successful field testing, another major technological advance from Staley's . . . The Staley Jet System. This revolutionary apparatus provides for the first time *positive control over the full range of cooked starch properties and characteristics*, along with *continuous automatic addition* at the wet end.

The Staley Jet System adjusts to suit your purpose over the entire range of properties to the exact proper mixture. Set it . . . forget it! Starch is cooked and added at the wet end, *continuously* and *uniformly*. You save mixing time, reduce starch consumption, and improve functional quality of starch suspensions. See about the increased efficiency and lower costs the new Staley Jet System will bring to your plant now! Your Staley technical paper representative will furnish complete information at your request, or write for descriptive brochure.

A. E. Staley Manufacturing Company, Decatur, Illinois

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Staley's
AND SOYBEANS

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Beater Starches
Calender Starches

outstanding performance

AT GREAT NORTHERN PAPER CO.

Ten Shartle 24-P Selectifier® Screens installed ahead of the new paper machine at Great Northern Paper Company, East Millinocket, Maine, have proved highly satisfactory on this newsprint application. On the strength of their outstanding performance, an additional ten Selectifier Screens will soon go into operation ahead of another new machine at this mill.

These totally-enclosed, rotary, pressure screens for final clean-up of stock are doing an excellent job in hundreds of mills on many grades ranging from tissue to boxboard.

THE BLACK-CLAWSON COMPANY

SHARTLE BROS. MACHINE DIVISION • MIDDLETOWN, OHIO

The Paper Industry

Technology • Engineering • Management • Production

VOLUME 37 • NUMBER 2 • MAY 1955

Published monthly by:
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Edward B. Fritz (1869-1939), Founder

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THE PAPER INDUSTRY—founded in 1919—known as "The Paper Industry and Paper World" from June, 1939, through December, 1949, assumed its original title with the January, 1950, issue.

Published at 1501 Washington Road, Mendota, Illinois.

Address all correspondence intended for publication to Editorial and Executive Office, 431 South Dearborn Street, Chicago 5, Illinois.

BPA

Member: Business Publications Audit of Circulation, Inc.

Entered as second class matter February 18, 1954, at the post office at Mendota, Illinois, under the Act of March 3, 1879.

Subscription rates: United States, U. S. Possessions, and Canada, $3.00 for one year, $5.00 for two years, $6.00 for three years. All other countries, $9.00 for one year, $18.00 for three years, payable in advance in U. S. Funds.

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The PAPER INDUSTRY is indexed regularly in **Engineering Index** and **Industrial Arts Index.** An index to each volume is issued annually by the publisher as a part of the April number.

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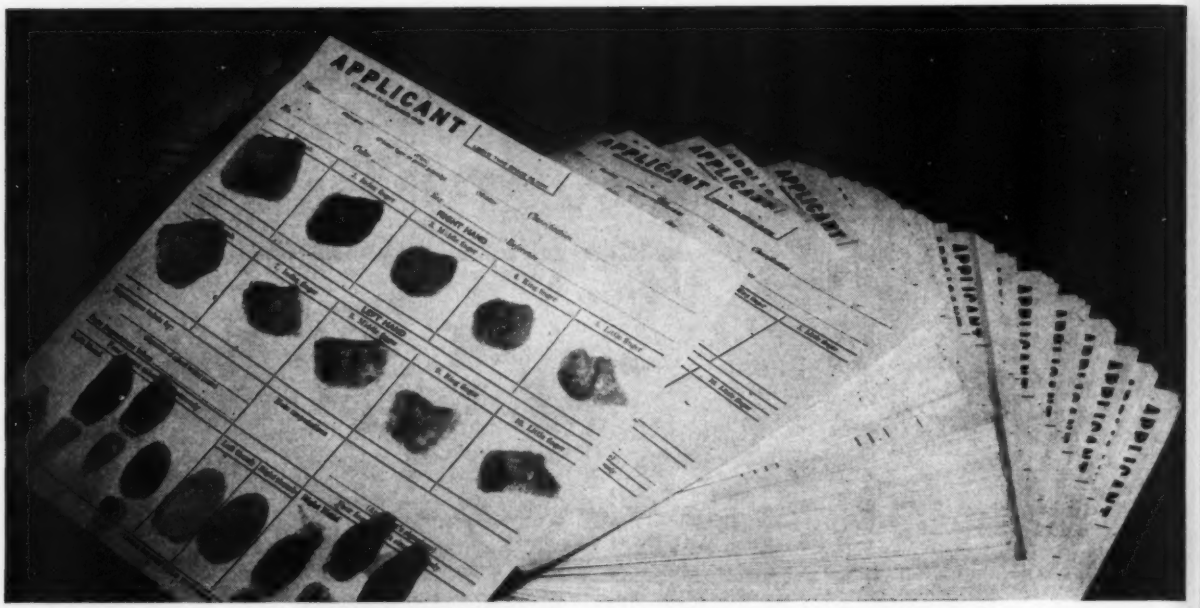

FINGERPRINT RECORDS are well preserved on Pexol-sized cards. The excellent and uniform sizing protects the cards from damage due to handling and accidental wetting.

BETTER SIZING THROUGH HERCULES PEXOL®

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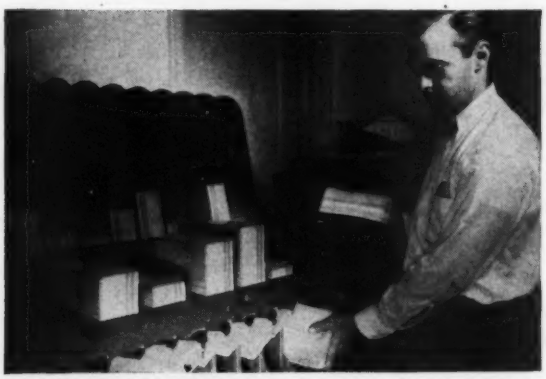
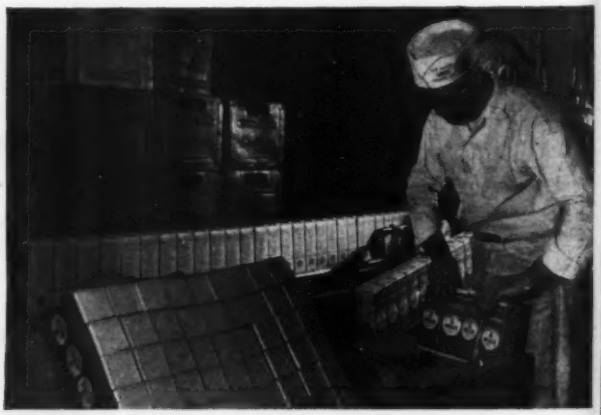
Like all Hercules papermaking chemicals, Pexol fortified size is available in numerous types to insure that there is one best suited for your own manufacturing requirements. Hercules' extensive research and service facilities put more than forty years of experience in the papermaking industry at your disposal.



FINGERTIP CONTROL of complicated files is practiced with modern automatic machinery. File cards inadequately sized are subject to serious damage or may be useless on becoming wet. Pexol, Hercules fortified size, provides the required protection.



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Paper Makers Chemical Department

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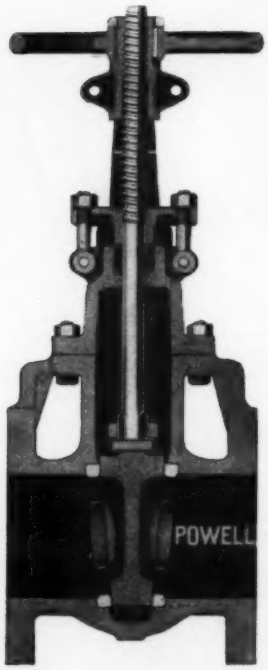

FIG. 1893 (Sectional)—
Alloy Cast Iron
O. S. & Y. Gate Valve
for 200 Pounds W. O. G.

Powell Valves are the choice of engineers because they know every valve is precision made, meeting every specification—every time.

And there are other good reasons why engineers prefer Powell Valves—because Powell Valves are dependable . . . economical . . . and Powell has the COMPLETE quality line of valves.

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The Wm. Powell Company
Cincinnati 22, Ohio... 109th year

FIG. 2192—
Ni-Resist* Large
Swing Check Valve
for 200 Pounds
W. O. G.

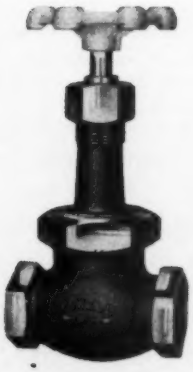

FIG. 2608—Bronze
Full Flow Globe Valve
for 200 Pounds W. P.

FIG. 375—Bronze
Gate Valve for 200
Pounds W. S. P.

*Trade-mark of The International Nickel Co.

POWELL VALVES

The Bauer Story on Hard Board and Insulating Board

Comprehensive information on hard and insulating boards is assembled in a binder available to a limited number of plant managers and technicians who are interested in the subject.

The contents are as follows:

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2. Table of Approximate Product Costs.
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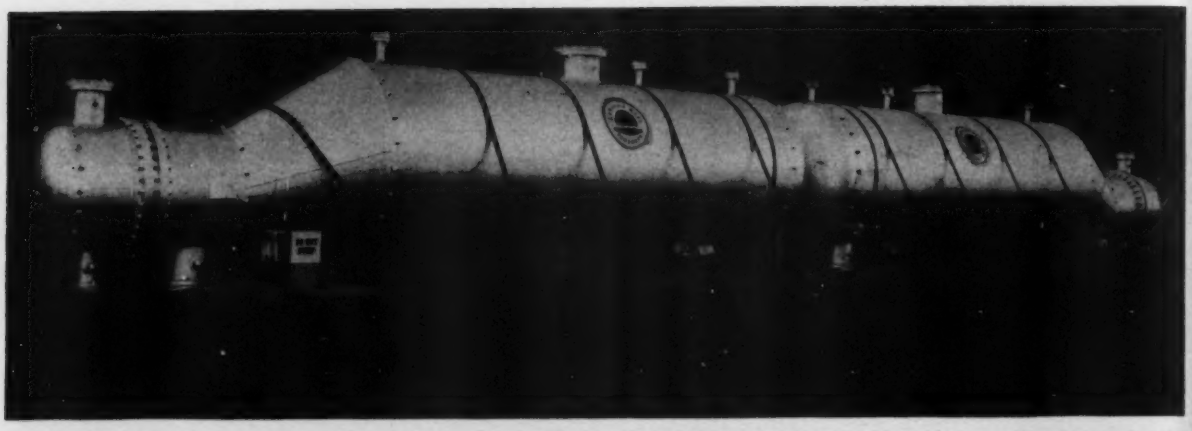

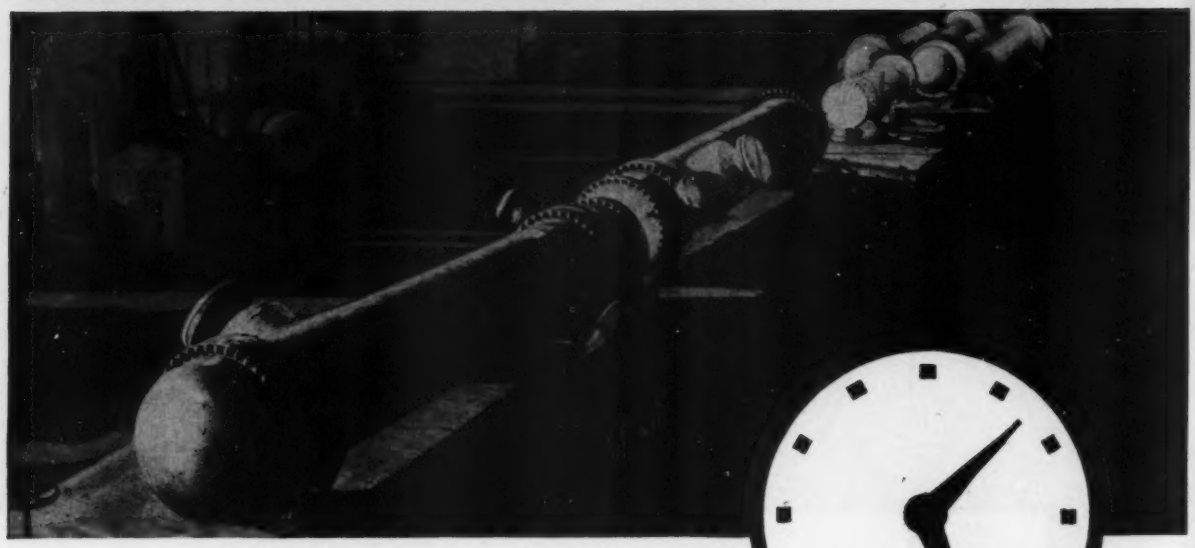

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REACH YOU FASTER!

Leaving the Kewanee, Ill. works, these Ross Exchangers and Kettle Type Reboilers will travel the shortest possible routes to their new owners. Naturally!

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Yes, it's a fact that Ross Exchangers and Condensers can stop the clock . . . *in a number of ways* . . . from the time you first consult with a Kewanee-Ross engineer until your product is delivered. (1) A great variety of standardized designs, in numerous sizes, often provide immediate solutions. (2) No matter how individualized, specially engineered units can frequently utilize many standard components and design features. (3) Unique experience over many years, in meeting greatly diversified requirements, is bound to include a "case" that closely parallels yours.

Make sure that your next exchangers and condensers reach you faster by consulting Kewanee-Ross early.

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DIVISION OF AMERICAN RADIATOR & STANDARD SANITARY CORPORATION
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ROSS

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Here's an automatic device that holds wet end caliper right where you want it . . . keeps its eye on the new born sheet . . . measures the thickness at several points across . . . never lets your finished sheet vary more than plus or minus half a point. Your chances of producing off-caliper rolls, with this watch-dog on the job, are practically eliminated. It automatically makes corrections by regulating the flow of stock . . . but it thinks first . . . waits until it's certain there's a definite trend established. Close control of wet end caliper provides more uniform drying and less weight variation.

It is simple, fast, direct and accurate. The Hurletron Control is always on the job, too. Never takes time out for a smoke. And all the time it's on the job it keeps a written chart record of the caliper at the wet end . . . and another chart record of caliper at the dry end. You have a complete history of every roll from start to finish.

Add it all up . . . you have consistent uniformity . . . high quality . . . with minimum waste of stock. You get greater production . . . less broke . . . with lower operating cost. The answer is . . . greater profit.

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Automatic
CALIPER and WEIGHT CONTROL

Want to know more? Want to learn how equipment like this has paid for itself over and over in leading mills? Write today. There's no obligation.

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1936 FAIRCHILD STREET • DANVILLE, ILLINOIS

Manufacturers of Hurletron automatic controls for Color Register; Center Line and Side Web Guide; Cut-off and Back-up; Moisture.

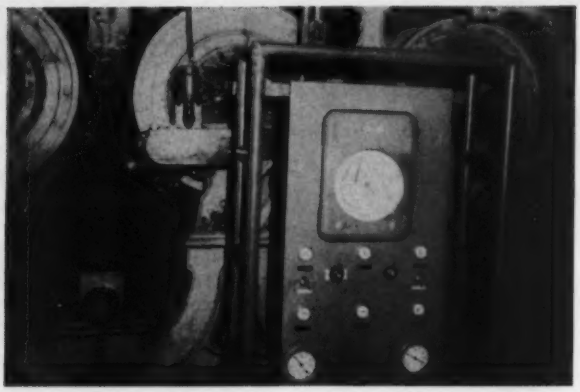
ASK FOR BULLETIN 211
It contains full details about Hurletron Caliper and Weight Controls . . . with charts, diagrams and photographs.

STICKLE NEWS

Stickle Equipment
Cuts the cost of steam

Published by Stickle Steam Specialties Co., 2215 Valley Ave., Indianapolis 18, Indiana

Newton Falls Paper Mill Reports on Stickle Moisture Control System



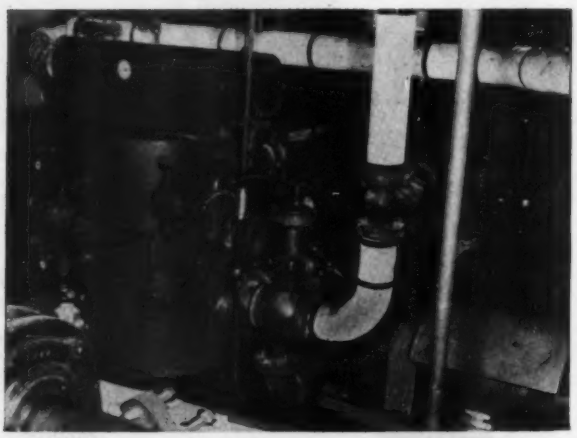
Automatically Maintains Moisture Content Within Plus or Minus 0.5 Percent

For the past year, the Newton Falls Paper Mill has operated the Stickle Pres-Ten-Trol moisture control system under practically every conceivable condition. Here is what Newton Falls men say about the Stickle system: (1) Maintains moisture content within plus or minus 0.5% on the average, (2) Restores proper moisture content after breaks up to eight times as fast as former methods, (3) Eliminates time-consuming hand adjustment of steam flow to the dryers, (4) Reduces complaints of customers on moisture variation, and (5) Reduces steam consumption. Put an end to your moisture control problems. Write for Stickle bulletin 360-C.

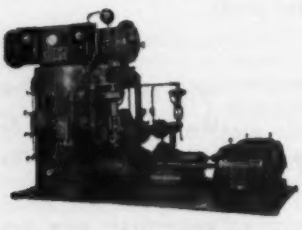
Drainage System Guaranteed to Increase Production, Lower Fuel Costs

Mills Report Dryer Capacity Up 20 to 30%; Fuel Costs Down 10 to 15%

Mill after mill reports higher production and lower fuel costs after installing the Stickle Vacuum Differential Drainage System. Here is an example. In one mill, the No. 4 machine was running at 590 to 600 f.p.m. at a drying pressure of 12 to 15 pounds. Attempts at higher speeds resulted in cockled paper and by-passed steam traps. After installation of the Stickle system, speed was increased to 750 to 800 f.p.m., at a drying pressure of 8 to 10 pounds — with no cockling and no traps by-passed. Main unit of the drainage system is the vacuum pump shown at right. Send for free bulletin 260. For paper board mills, the Stickle Differential Drainage and Boiler Return System (Bulletin 160) is recommended.



"X-Ray" view of the Stickle Open Coil Deaerating Feed Water Heater . . . guaranteed to heat more water to higher temperature in less space than any other heater at any price. Capacities: 3,000 to 300,000 pounds per hour.

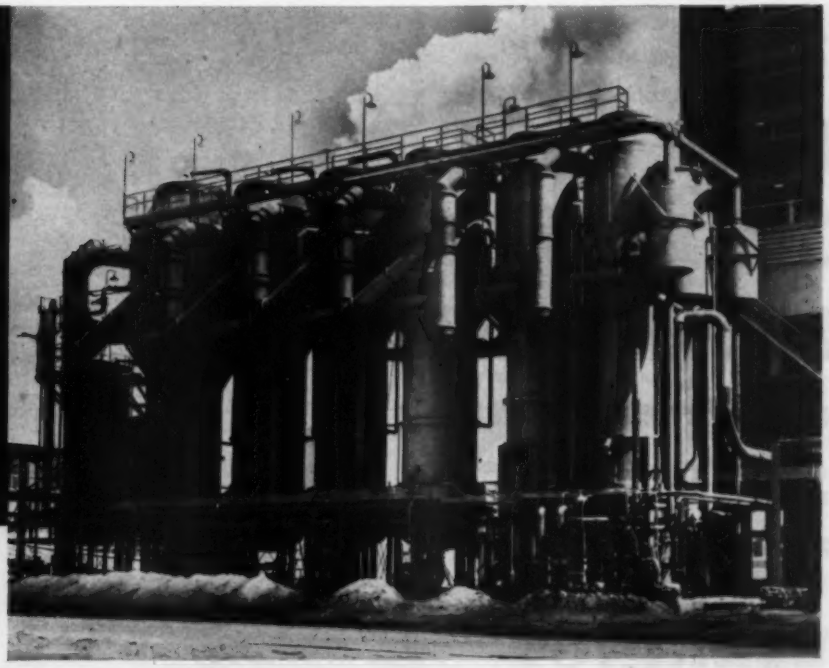


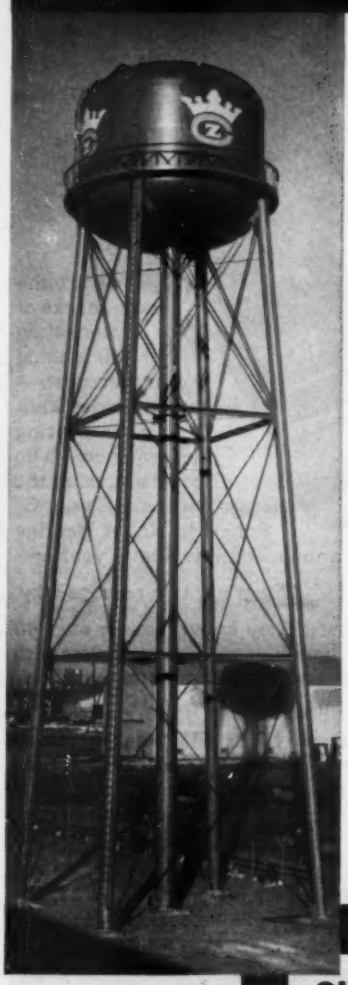
The Stickle Vacuum Pump is main unit of the Vacuum Differential Drainage System. Single and duplex models. Capacities up to 300 GPM (water) and 290 CFM (air); or 900 GPM (water only).

Stickle Visible Micro Adjustable Orifice permits accurate modulated temperature control on dryers with visible operation. Eliminates steam losses due to excessive "blowing through" into return lines.

Stickle Automatic Differential Valve controls exact differentials in pressure between two sections of paper machine, assuring proper drainage at all pressures.

A Common Sight to be Seen in the Paper Industry





◀ Left: 100,000-gal. Horton elevated tank located at the Crown Zellerbach Paper Company, East Los Angeles, California.

▲ Above: Conkey 8 Body Sextuple Effect Black Liquor Evaporators. They are code constructed throughout.

Increasingly, CB&I and Conkey equipment ARE sights that can be seen in the paper industry. Horton® elevated tanks, digesters and other welded steel plate structures and Conkey filters, evaporators and crystallizers are providing operators with the type of equipment that helps make profits.

Conkey and CB&I installations are becoming more numerous daily. CB&I's four strategically located plants are completely equipped to meet the most exacting specifications . . . including X-raying, stress-relieving and pickling and painting fabricated plates and shapes. Further information on either Conkey equipment or CB&I structures may be obtained by writing our nearest office.

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are already putting

SKF TYPE "C" BEARINGS

in their products

Here are the trade marks of a few of more than 300 leading manufacturers – companies who want extra bearing performance – who already are using the *improved* SKF Type "C" Spherical Roller Bearing announced less than a year ago.

There are two reasons why

First: They know that for over 40 years, SKF has been *first* with anti-friction developments that *work*.

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– manufacturers of **SKF** *and* HESS-BRIGHT® *bearings.*

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BALL AND ROLLER BEARINGS

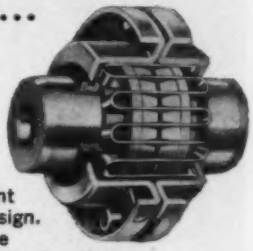
The exclusive grid-groove design of FALK Steelflex Couplings protects your machinery in two ways

You get double protection when you connect your driving and driven machinery with a Falk Steelflex Coupling—the all-steel-built coupling with the exclusive grid-groove design! First, its torsional resilience smothers shock and vibration; and second, the Steelflex design prevents damage and lowered efficiency by accommodating shaft misalignment.

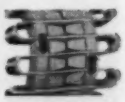
Why have increasing numbers of key men in industry standardized on Falk Steelflex Couplings? Their experience has proved that Falk Steelflex Couplings prolong the service life of their machinery...are trouble-free and need minimum maintenance...are easy to install, lubricate and disconnect ...and cost less per year of service than ordinary couplings.

One basic Steelflex design—the Type F, in its many sizes—is adaptable to more than 90% of all industrial applications. This facilitates buying, as well as prompt replacing and servicing when necessary. Write to Department 247 for engineering bulletin, including selection and dimension details.

How shock and vibration are smothered by the FALK Steelflex Coupling's Torsional Resilience...

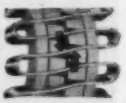


This cutaway view shows the sturdy all-steel construction, also the exclusive, torsionally resilient grid-groove design. Here is how the grid-groove design functions:



UNDER LIGHT LOADS The gridmember bears only at outer edges of grooves. The long span between points of contact remains free to flex under load variations.

UNDER NORMAL LOADS As load increases, the distance between supports on grooves is shortened proportionately, but a free span remains to cushion shock loads.



UNDER SHOCK LOADS Under extreme overloads, the gridmember bears fully on the grooves and transmits full load directly. The coupling remains flexible, within its rated capacity.

SHAFT MISALIGNMENT ACCOMMODATED
Free End Float Permitted

Controlled flexibility in the FALK Steelflex coupling provides compensation for parallel and angular shaft misalignment—and permits free end float for the shafts of the driving and driven members, or of either one.

PARALLEL MISALIGNMENT

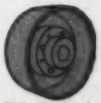
ANGULAR MISALIGNMENT

FREE END FLOAT

Rapid CM—Reversing Service

H and HH High Speeds

FS—Limited Space



BW—Brakewheel Service

FT—Overload Control

P and PP Extended Shaft

OTHER TYPES AVAILABLE

In addition to the standard Type F (which meets more than 90% of all applications), special or dual purpose Steelflex designs are available for unusual applications. A few of the many types are shown here.

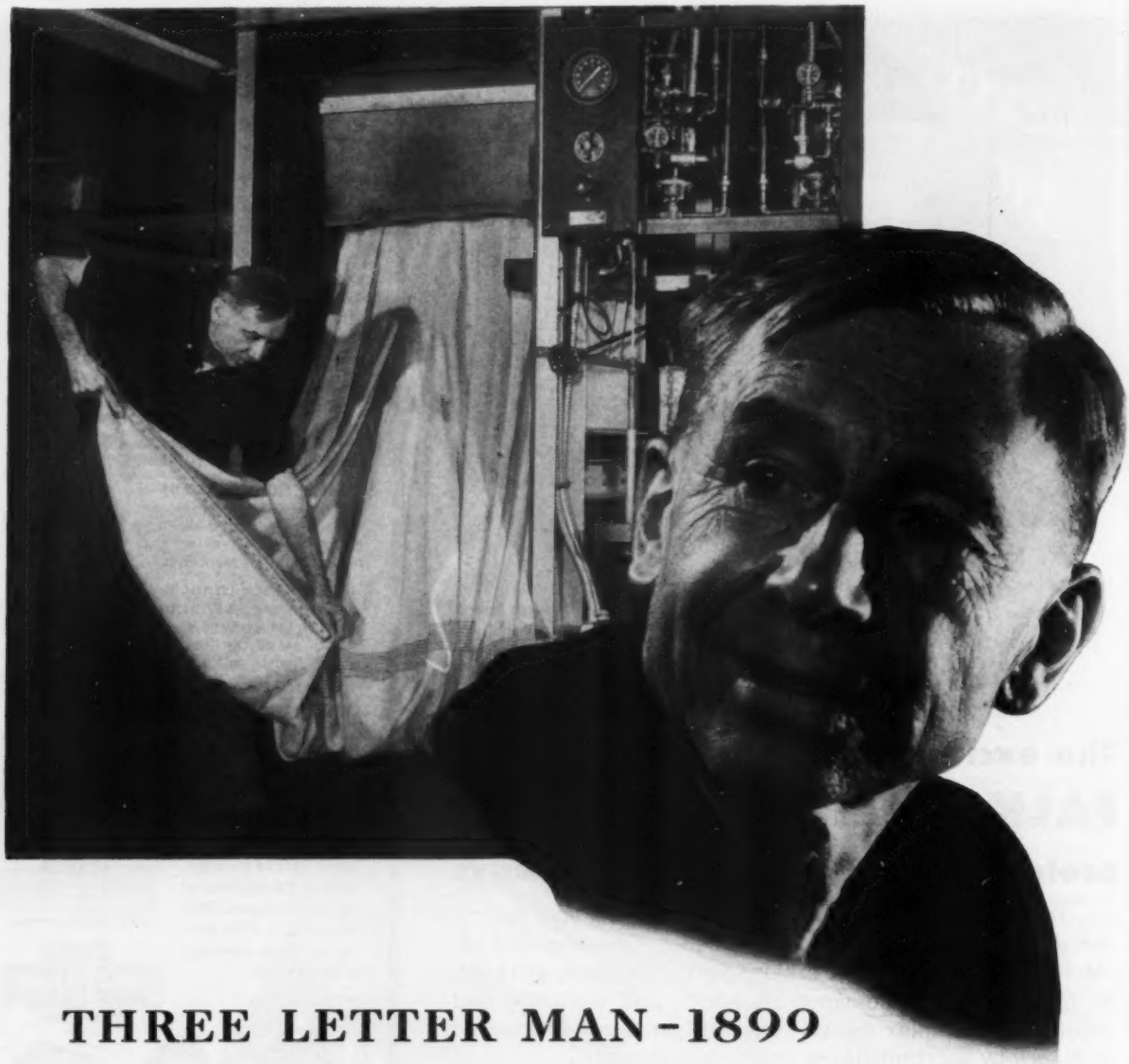
THE FALK CORPORATION, Milwaukee 8, Wisconsin

MANUFACTURERS OF

- Motoreducers
- Speed Reducers
- Flexible Couplings
- Shaft Mounted Drives
- High Speed Drives
- Special Gear Drives
- Single Helical Gears
- Herringbone Gears
- Marine Drives
- Steel Castings
- Weldments
- Contract Machining

FALK

...a good name in industry



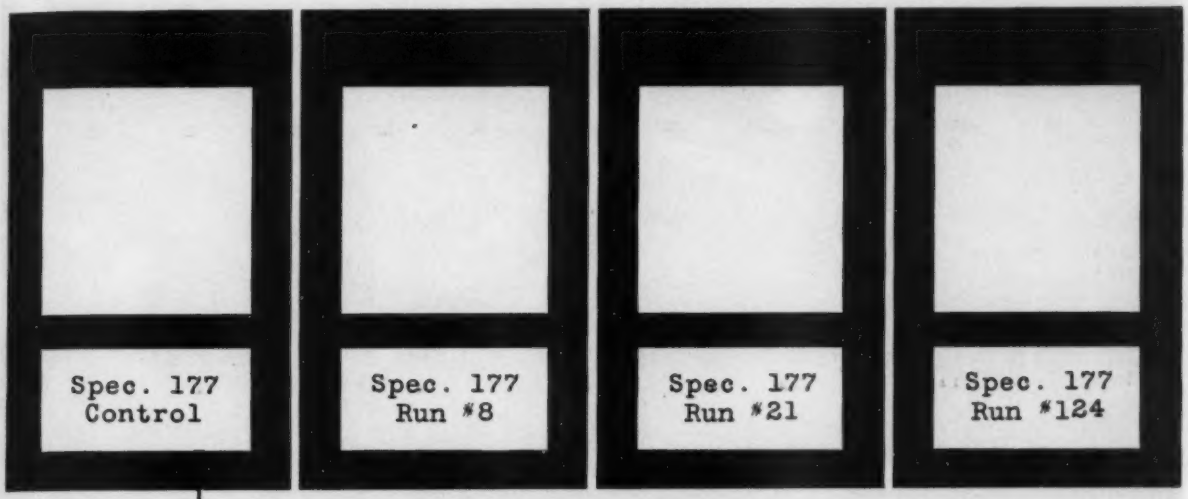
THREE LETTER MAN-1899

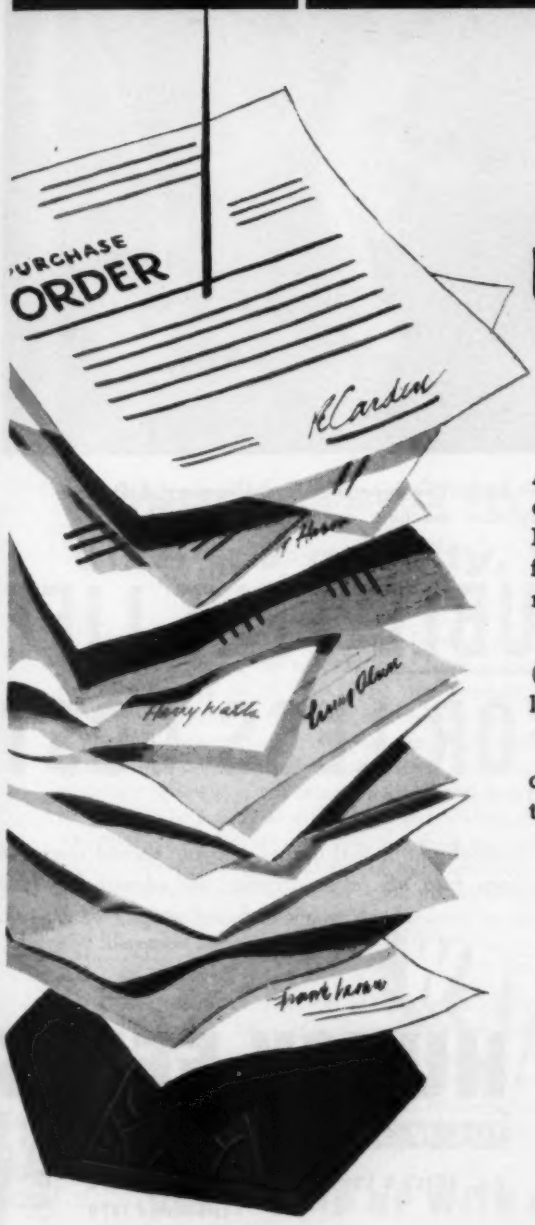
This is keen, wiry Frank Hammer. A real athlete as a boy, he starred in baseball and played rugged football and basketball, too. And, for 53 years, Frank has been putting his vitality and team spirit to good use in the production of sturdy felts. Today he's a fulling expert—checking Appleton felts through the fulling mill that shrinks them down for finish, strength, and a good, firm fit.

Frank Hammer is typical of the steady, long-experienced workers at the Appleton Woolen Mills . . . a 73-year-old organization dedicated to development, progress, and the production of ever finer felts—for the finest paper-making.

APPLETON WOOLEN MILLS

APPLETON, WISCONSIN





For repeat orders, develop

PRODUCT UNIFORMITY

with EAGLE® Corn Starch

A competitively-priced board with a uniform, durable printing surface gets repeat orders. Eagle Brand Corn Starch assures you of an improved finish and a better printing surface, which will resist scuffing.

Paper men recommend Eagle Corn Starch (an acid-converted starch) for its ease of cooking, low cold water solubility and low viscosity.

No matter how unique and or rigid your specifications, Eagle starches meet them. For a complete technical demonstration, please get in touch with

Corn Products Refining Company
17 Battery Place, New York 4, N. Y.

EAGLE
BRAND
acid-converted
CORN STARCH

Howard Buscher, Supervisor of the Peoria, Ill. plant of the Barrett Division of Allied Chemical & Dye Corporation, checking record-breaking felt on single cylinder machine operated by Louis Lester.

BARRETT GETS DOUBLE FELT LIFE *at higher speed-* FOR LESS COST

The Barrett Division of Allied Chemical & Dye Corporation employs this single cylinder machine to make saturating felt, used in the manufacture of roofing, at its Peoria, Ill. plant. As one of the world's largest producers of this material, Barrett is widely known for the efficiency of its mill operations and the uniform high quality of its products.

The Huyck papermaker's felt on the machine is making a record run . . . operating at a higher maintained speed than ever before . . . producing more high quality material per day . . . and lasting twice as long. Best of all, it is substantially reducing felt cost per ton!

The same thinking that makes possible record runs like this goes into all felts carrying the identifying blue and red stripes of Huyck.

NEW!

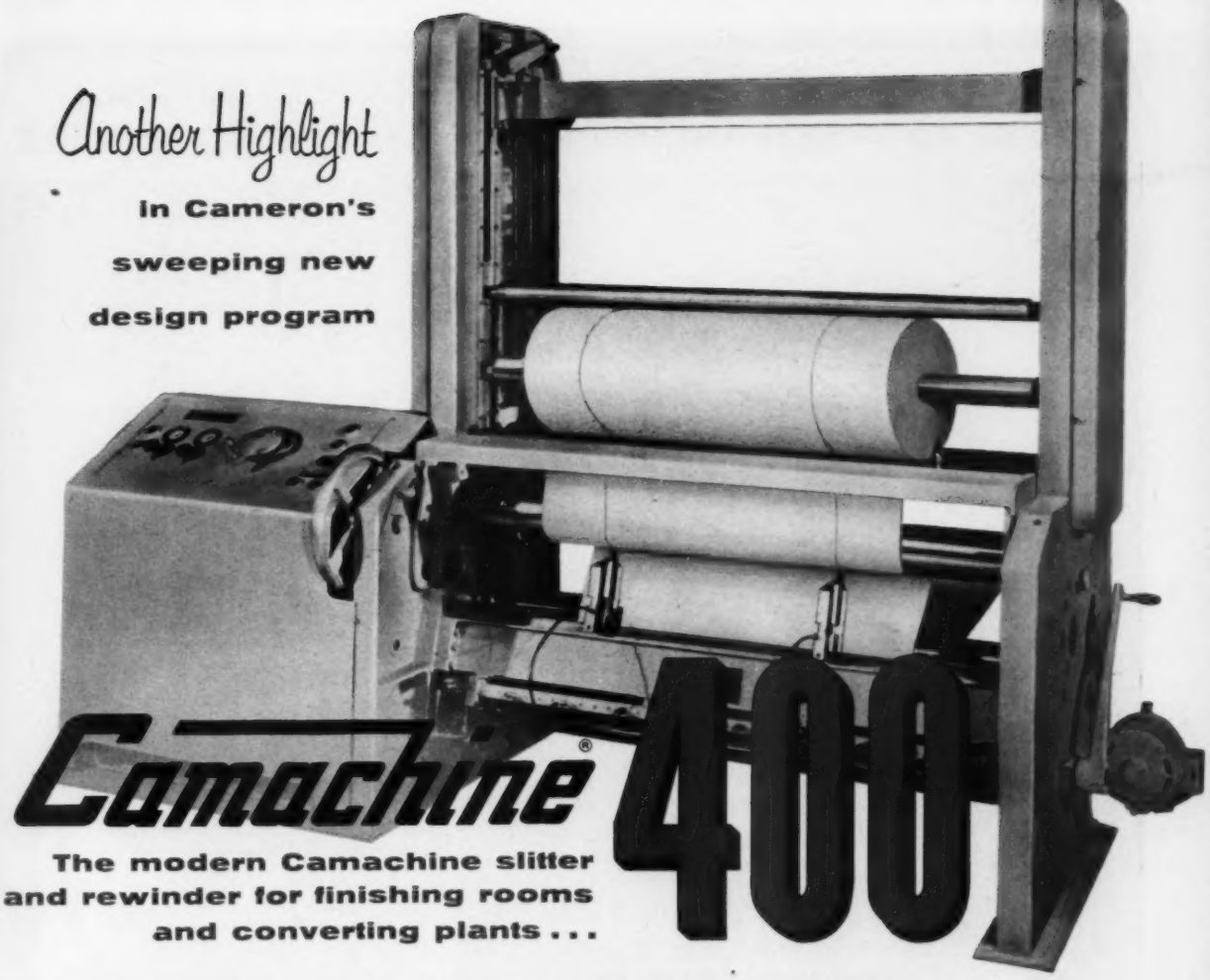
HUYCK FELTS

FIRST IN QUALITY... FIRST IN SERVICE

F. C. HUYCK & SONS • Rensselaer, New York
Established 1870

Another Highlight

in Cameron's sweeping new design program



Camachine® 400

The modern Camachine slitter and rewinder for finishing rooms and converting plants . . .

unsurpassed in a winder of its size for quality, versatility, productivity

PRODUCTIVITY: The versatile production range of the 400 provides speeds up to 1000 fpm* with a maximum rewind capacity of 30" dia. The 400 permits quick-changeover-choice of the best slitting method for the material to be handled—shear-cut, razor-cut, and either Camachine pneumatic or spring-lever score-cut. For optimum speed and efficiency in small roll production the 400 can be equipped with an automatic stop, electric-operated riding roll lift, roll ejector, shaft injector, and tucker. Speed, tension, and riding roll pressure may be controlled to suit the material being processed. All operating controls are panel mounted for easy accessibility and increased productivity.

DEPENDABILITY: The 400 is built with sturdy one-piece side frames. All rolls and rotating components run in anti-friction bearings. Rolls are positively locked axially to eliminate end play and to assure optimum web control. The rewind shaft bearing carriages are also designed to eliminate end play and to prevent strip interweave. Important design features which contribute to the exceptionally smooth operation of the 400, resulting in long machine life, include the precise, dynamic balancing of all rotating elements and the silent-running positive tooth belts on the main drive.

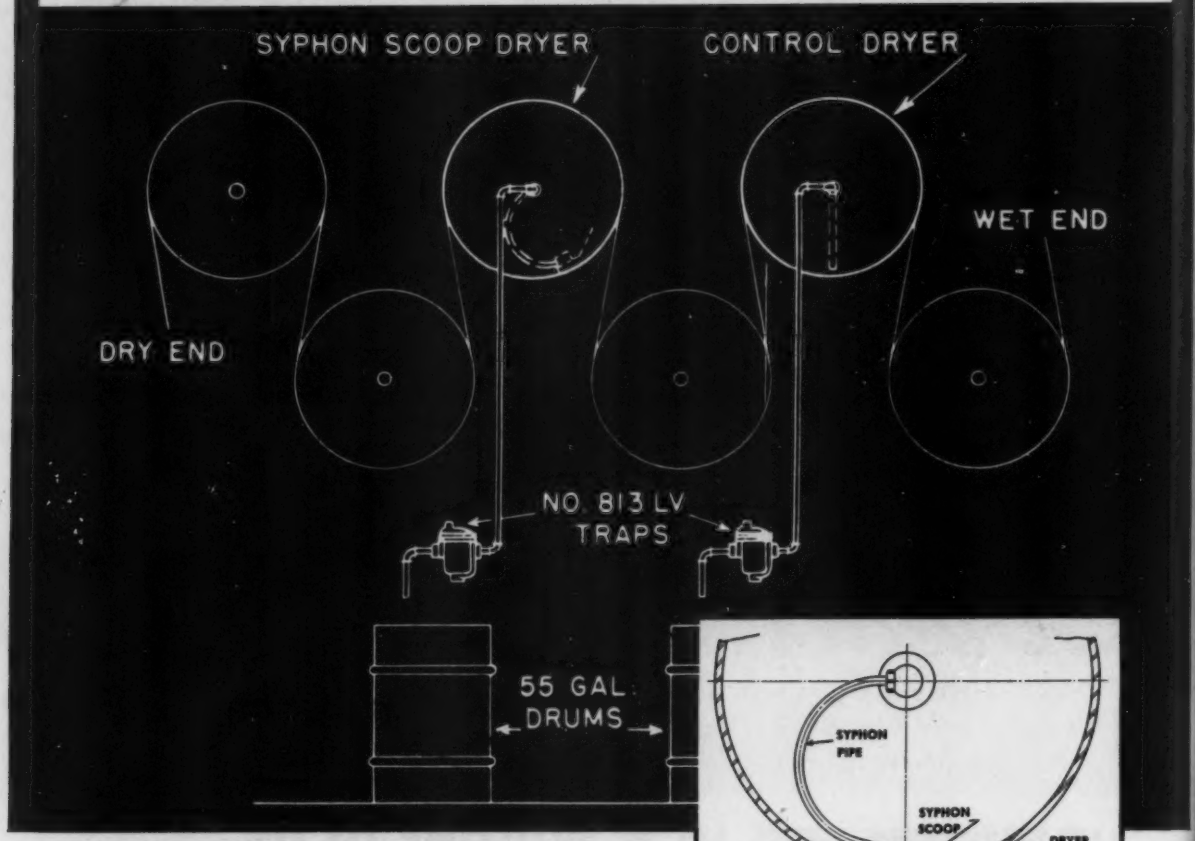
QUALITY: The new 400 can be readily adapted to meet the exact requirements of the material which is being processed. The best slitting method for the job can be selected, whether score-cut, shear-cut, or razor-cut. Slitting elements are conveniently located for easy setting-up and adjustment, to assure accuracy of strip width. The counterbalanced riding roll is belt-driven at both ends for optimum pressure distribution across the full width of the rewinding rolls. The combination of clean, accurate slitting and superior web control from start to finish of the run means consistent top-quality roll production on all types of material.

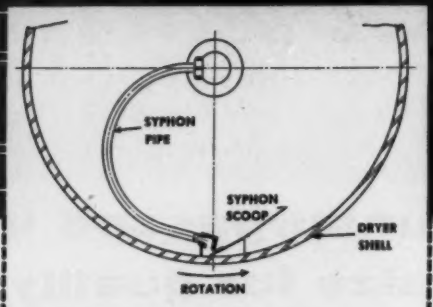
*Speed is dependent upon the character of the material to be processed and the machine width.

DON'T WIND UP WITH LESS THAN A Camachine

CAMERON MACHINE COMPANY • 61 Poplar Street • Brooklyn 1, N. Y.

ARMSTRONG SYPHON-SCOOP GIVES BETTER, MORE COMPLETE DRAINAGE OF REVOLVING DRYERS





Test shows superiority of Armstrong Syphon-Scoop over stationary syphon.

TEST— To determine the advantage of an Armstrong Syphon-Scoop as compared to a stationary syphon for draining 60" diameter 168" face dryers operating at 720 FPM drying kraft paper, a test set-up was made as diagramed. Condensing rate of the two dryers was approximately the same.

RESULTS— In a 3½ hour period the trap draining the Syphon-Scoop Dryer discharged 85 gallons (700 lbs) more condensate than did the trap draining the Control Dryer.

CONCLUSION — 1—By keeping dryer practically empty, less horsepower is required to drive the machine.

2—By preventing any build-up of condensate in the dryer, there is no surging of condensate with adverse effect on life of syphons. On this machine where the tests were made, average life of stationary syphon pipes is only one year.

Less horsepower, greater efficiency, lower maintenance are the benefits derived

The Armstrong Syphon-Scoop is a combination of the two major methods employed today of removing condensate from revolving dryers—the revolving scoop and the syphon. By combining these two methods into one, Armstrong has successfully eliminated the disadvantages of each and captured all the advantages. Above rimming speeds only a 1/16" rim of condensate can remain in the dryer. Below rimming speeds, the generous scoop removes condensate *just as fast as it forms.*

As a result, less horsepower is required to operate the dryers, heat transfer efficiency is improved and maintenance is reduced because there is less wear and tear on the Syphon-Scoop than on stationary syphon pipes. For complete details write:

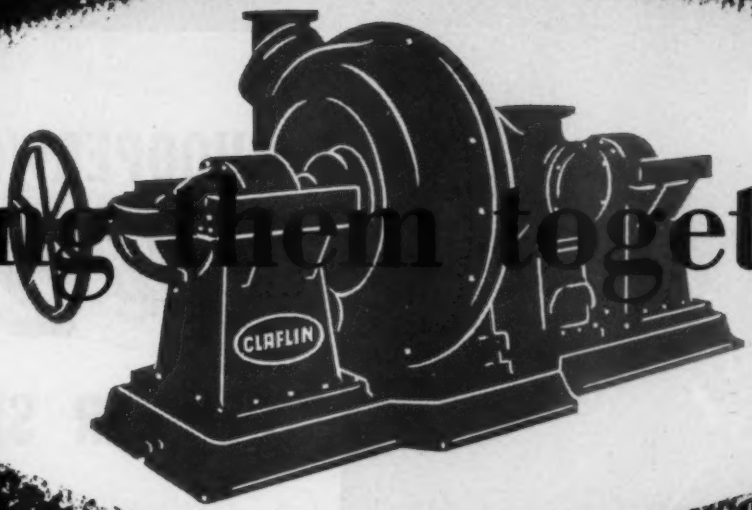
ARMSTRONG MACHINE WORKS,
816 Hoffman Street, Three Rivers, Michigan

PM15

GUARANTEED

ARMSTRONG SYPHON-SCOOP

bring them together*



...d of printing.
...s as pre-refiners and
... other final stock treating units.

Now, for the first time, CLAFLIN refiners are built by EMERSON, a name respected for precision refining equipment.

Greater tonnage and better stock treatment are proved results when you "bring together" CLAFLINS and final stock treating units.

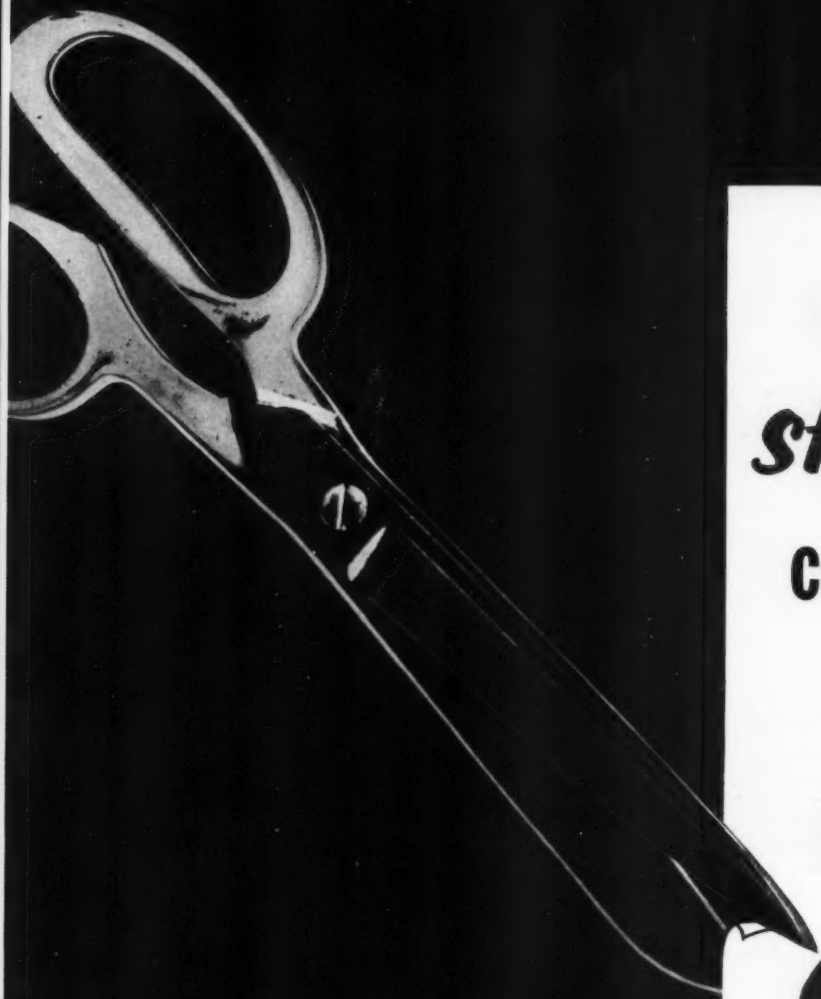
- Claflins *are used as continuous beaters and refiners;*
- *for separate one pass prebeating of soda, sulphite and kraft pulps;*
- *in the Pulp mill for defibering before washing.*

With low installation and maintenance costs CLAFLINS provide the perfect solution for pre-refining of stock. EMERSON supplies CLAFLIN machines and CLAFLIN fillings to fit all types of primary refining and beating operations.

Ask your EMERSON representative for further information on these versatile refiners.

Claflin CONTINUOUS BEATERS AND REFINERS

THE EMERSON MANUFACTURING COMPANY
Division of John W. BOLTON & Sons, Inc.
Lawrence, Massachusetts, U. S. A.



HOOPERWOOD

style 200

CLIPPER SEAMS

cut

DRYER FELT

costs

Stronger than conventional clipper seams—particularly effective on high speed machines, or machines with small diameter felt rolls. Ask for sample.

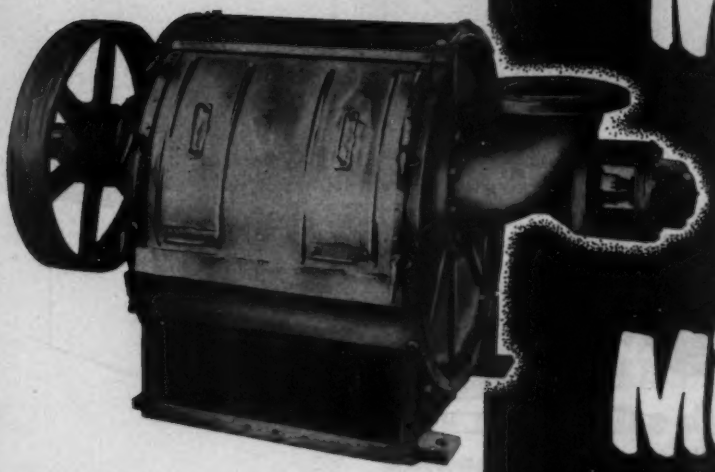
WM. E. HOOPER & SONS CO.

GENERAL SALES OFFICES — Liberty Trust Building, Broad & Arch Sts., Phila. 7; 320 Broadway, New York 7; 300 W. Adams St., Chicago 6

HOOPERWOOD MILLS — Woodberry, Baltimore 11

COTTON and ASBESTOS DRYER FELTS

COTTON and NYLON CARRIER ROPE



The "Junior" Screen . . . smallest of *three* units producing from 35 to 150 tons per day, respectively.

Money Saving Midgets

Cowan Centrifugal Pulp Screens by

APPLETON MACHINE COMPANY

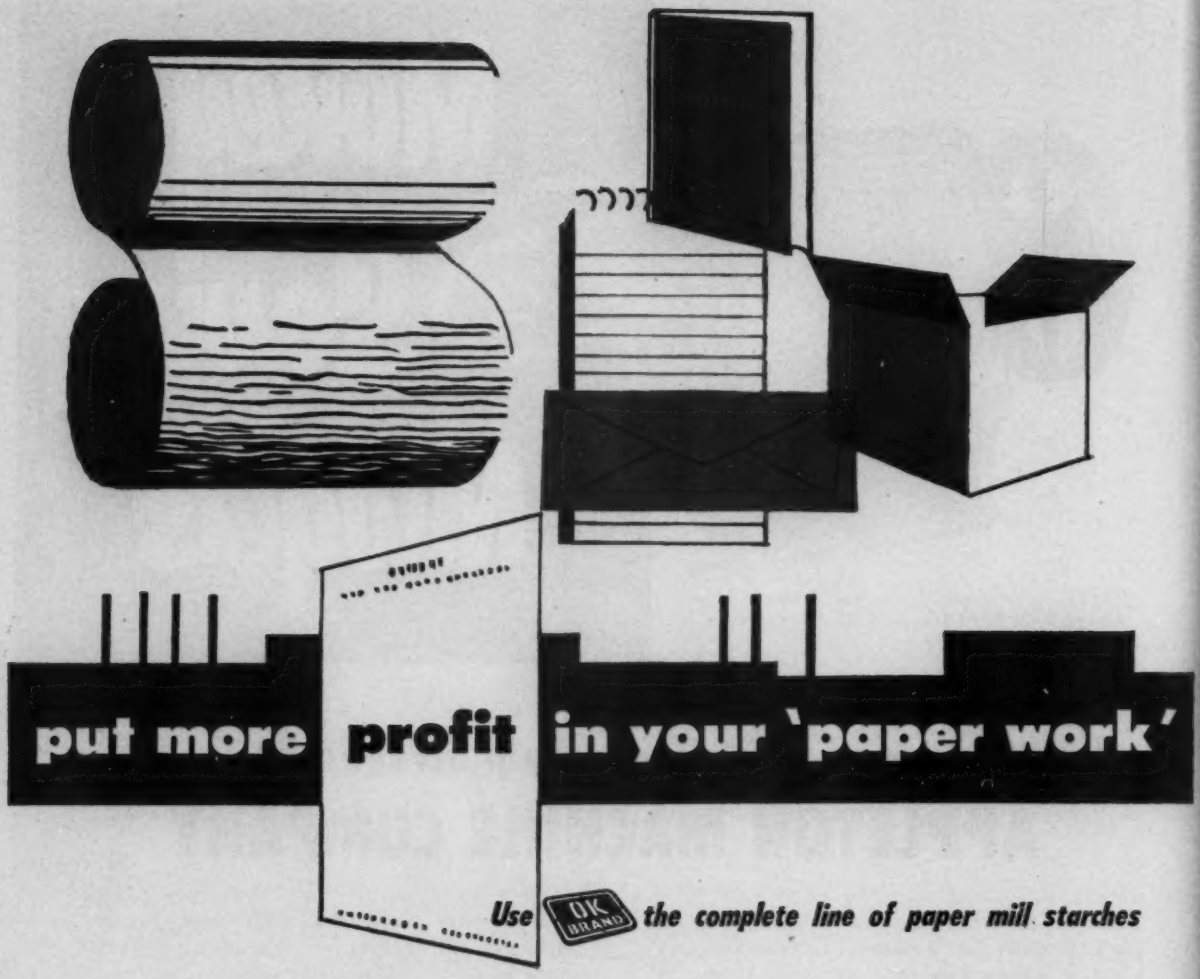
Added efficiency, greater economy are the watchwords for *Appleton Machine Company's* junior versions of the standard Mark "A" Cowan Centrifugal Pulp Screen, acknowledged as outstanding in its field.

The Mark "E" Screen is a half-sized model of the standard Mark "A", conservatively rated at a capacity of 2400 U.S.G.P.M. accepted stock. 50 h.p. is required to operate the Mark "E", but its drive is designed to accommodate a 60 h.p. motor, wherever needed. The Mark "E" is particularly advantageous in smaller mills, or as a supplementary screening unit. Also, installing two Mark "E" Screens—instead of a single larger machine—provides a definite safety factor in case of breakdown.

The "Junior" Screen is a quarter-sized model of the big Mark "A", with a rated capacity of 1400 U.S.G.P.M. accepted stock. 25 h.p. operates the "Junior" Screen, but it will handle motors up to 40 h.p. Greatest applications are as secondary screening units, and as a primary screen for mills producing a variety of pulp grades which require a system made up of small, separate units.

Performance of these two Cowan Screens is comparable in every way to that of the standard Mark "A" Screen . . . the same high consistency screening . . . low percent rejects . . . good fiber separation . . . low shower dilution pressure . . . top hydraulic efficiency. Typically sound *Appleton Machine* construction plus a protective coating tailored to fit your needs *complete* your assurance of long-time satisfaction.

CUSTOM-BUILDERS OF PULP & PAPER MILL MACHINES
WINDERS • FINISHING ROLLS • REWINDERS



The superior quality of OK BRAND starches gives you improved tub, beater, and calender sizing. Better for coating and adhesives, too. When you make better paper at no extra cost — you've put more profit in your "paper work". Try OK BRAND and see! Discuss your special starch requirements with Hubinger's expert technicians.

the stamp of quality

ESTABLISHED IN 1881
THE HUBINGER COMPANY
KEOKUK, IOWA

New York • Chicago • Los Angeles • Boston • Charlotte

OK BRAND

Try these top-quality starches for paper makers:

- OK BRAND Pearl
- OK BRAND E-Type Pearl
- OK BRAND Pearl 700
- OK BRAND Pre-Jel
- OK BRAND Thin Boiling Starch
- OK BRAND Oxidized Starches

NEW STANODIESEL OIL M

...tionary industrial engine lubricant developed specifically to meet problems posed by new engine designs, higher loads, economy fuels

New STANODIESEL Oil M meets—and with plenty to spare—the performance requirements imposed on diesel lubricants by new engine designs, higher loads and the use of economy fuels. It meets these requirements because, first of all, it is an oil refined from the finest quality base stocks. It thus has superior stability. Then additives exclusive with STANODIESEL Oil M have been blended with these base stocks. The additives do these things:

1	**INHIBIT OXIDATION.** Prevent unwanted increases in oil viscosity. Prevent corrosion of bearings.
2	**PROVIDE DETERGENT-DISPERSANT ACTION.** Keep crankcase, pistons, cylinder walls and other parts clean. Keep contaminants in suspension, prevent redeposit.
3	**PROVIDE ANTI-FOAM ACTION.** Foaming tendencies of oil are controlled. Oil is suitable for use in hydraulic governors.
4	**INCREASE LUBRICITY.** Wetting agent increases oil's ability to reach and maintain a film on highly stressed parts.

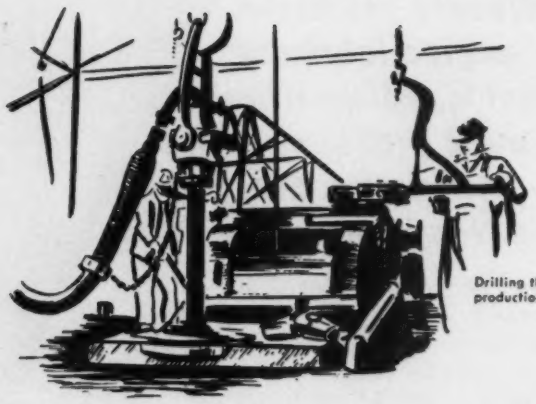
STANODIESEL Oil M is a "Mil" type oil.

Your next move? Find out how STANODIESEL Oil M can serve you. In the Midwest call your nearby Standard Oil lubrication specialist. Or contact Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

STANODIESEL OIL M
Does these things for your engine

1. Lessens engine deposits, ring and cylinder wear.
2. Lessens spark plug fouling.
3. Lessens fuel injector and pump sticking resulting from engine deposits.

STANDARD


Drilling the production wells

Crude Sulphur

for Industrial Use

from the properties of

Texas Gulf Sulphur Co.

75 East 45th Street • New York 17, N. Y.

Producing Units

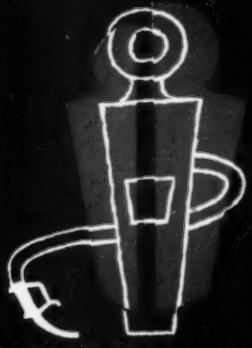
- **NEWGULF, TEXAS**
- **MOSS BLUFF, TEXAS**
- **SPINDLETOP, TEXAS**
- **WORLAND, WYOMING**

ask the man from Layne anything about water...

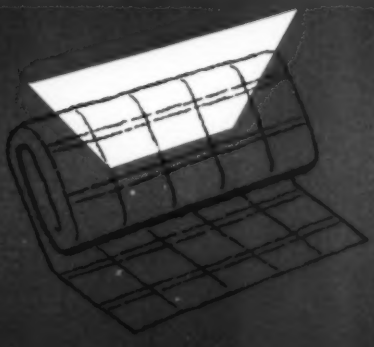
the irreplaceable essential in modern production

DID YOU KNOW THAT IT TAKES:

gallons of water to produce
1 gallon of milk

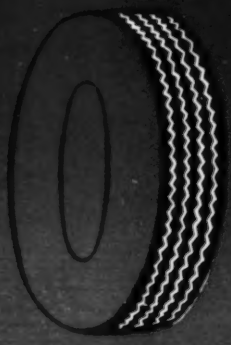


10 gallons of water to produce
1 gallon of gasoline

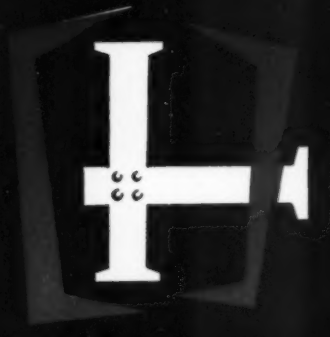


75 gallons of water to produce
1 pound of fabric

gallons of water to produce
1 KW hour electricity



300 gallons of water to produce
1 pound of synthetic rubber



65,000 gallons of water to
produce 1 ton of steel

The man from Layne knows most about water . . . how to develop and apply it to serve best the needs of agriculture, industry and municipality.

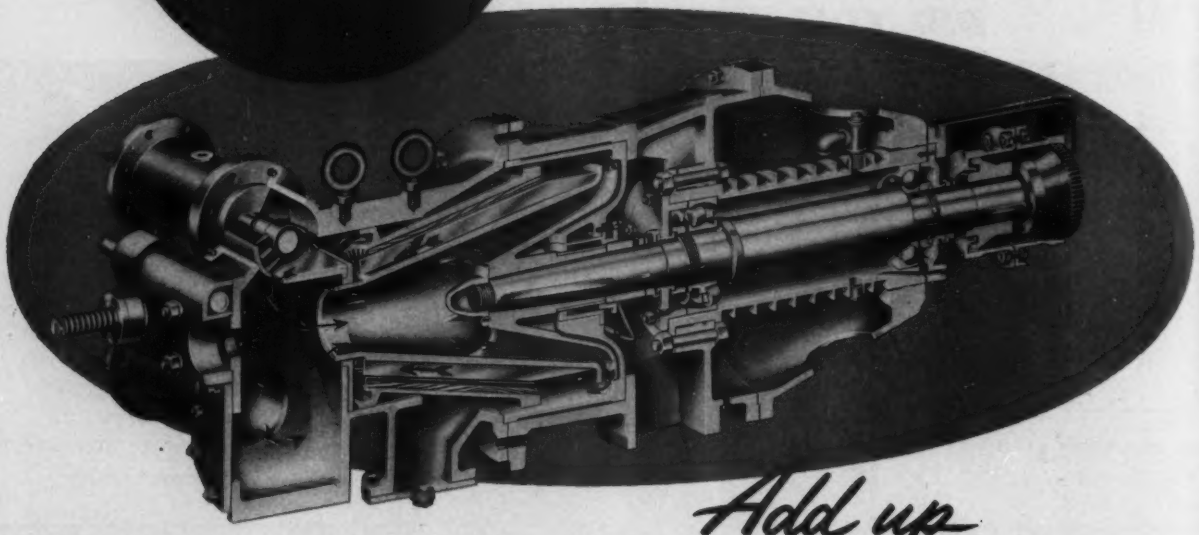
LAYNE & BOWLER, INC.
MEMPHIS 8, TENNESSEE

Layne Associate Companies Throughout the World

water wells • vertical turbine pumps • water treatment

MORDEN *Stock-Maker*

combines the best time-proven beating principles into one simple versatile machine.



Hundreds of "Stock-Makers" throughout the world, operating on all types of pulps and grades of paper, have proven the effectiveness and efficiency of "Stock-Maker" beating—from light brushing for soft tissue, to medium treatment for writings, wrappings, etc., on up through extreme hydration for greaseproof and carbon.

"Stock-Makers" can be used advantageously for continuous, single-pass, closed-system beating, direct to the paper or board machine. They can be readily adjusted to handle many variations in treatment requirements.

Add up

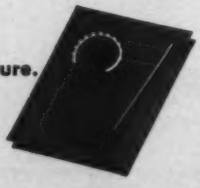
these advantages over conventional beaters

- **REQUIRES 1/2 THE POWER PER TON**
- **REQUIRES 1/3 THE SPACE**
- **REQUIRES NONE OF THE LABOR**
- **SAVES MAINTENANCE COSTS**

the Answer... MORDEN-IZE!

MORDEN SLUSH-MAKER FOR PULPING
MORDEN STOCK-MAKER FOR BEATING
MORDEN STUFF-MAKER FOR JORDANING

GET ALL THE FACTS!
Send for "Stock-Maker" brochure.



MORDEN
STOCK PREPARATION EQUIPMENT
MACHINES COMPANY
3420 S. W. MACADAM — PORTLAND, OREGON

Northeastern States Representatives:
ORTON CORPORATION, Fitchburg, Massachusetts

Midwestern States Representatives:
DAN B. CHAPMAN, Appleton, Wisconsin

Other Representatives in most paper-making countries.

TEST-PROVE *for yourself*

the sizing ability of versatile

KELGIN

products

obtain smooth, high gloss, mottle free printing ---- at reduced ink costs with

KELGIN / KELGIN LV / KELGIN XL

When applied on either calender stack or size press as a .75% — 3.5% solution, the following advantages may be expected:

• Smooth, high-density finish • Reduced wax penetration • Improved surface wax film • Greater brightness when waxed • Improved varnish holdout.

KELGIN® / KELGIN LV® / KELGIN XL®

products of **KELCO** Company

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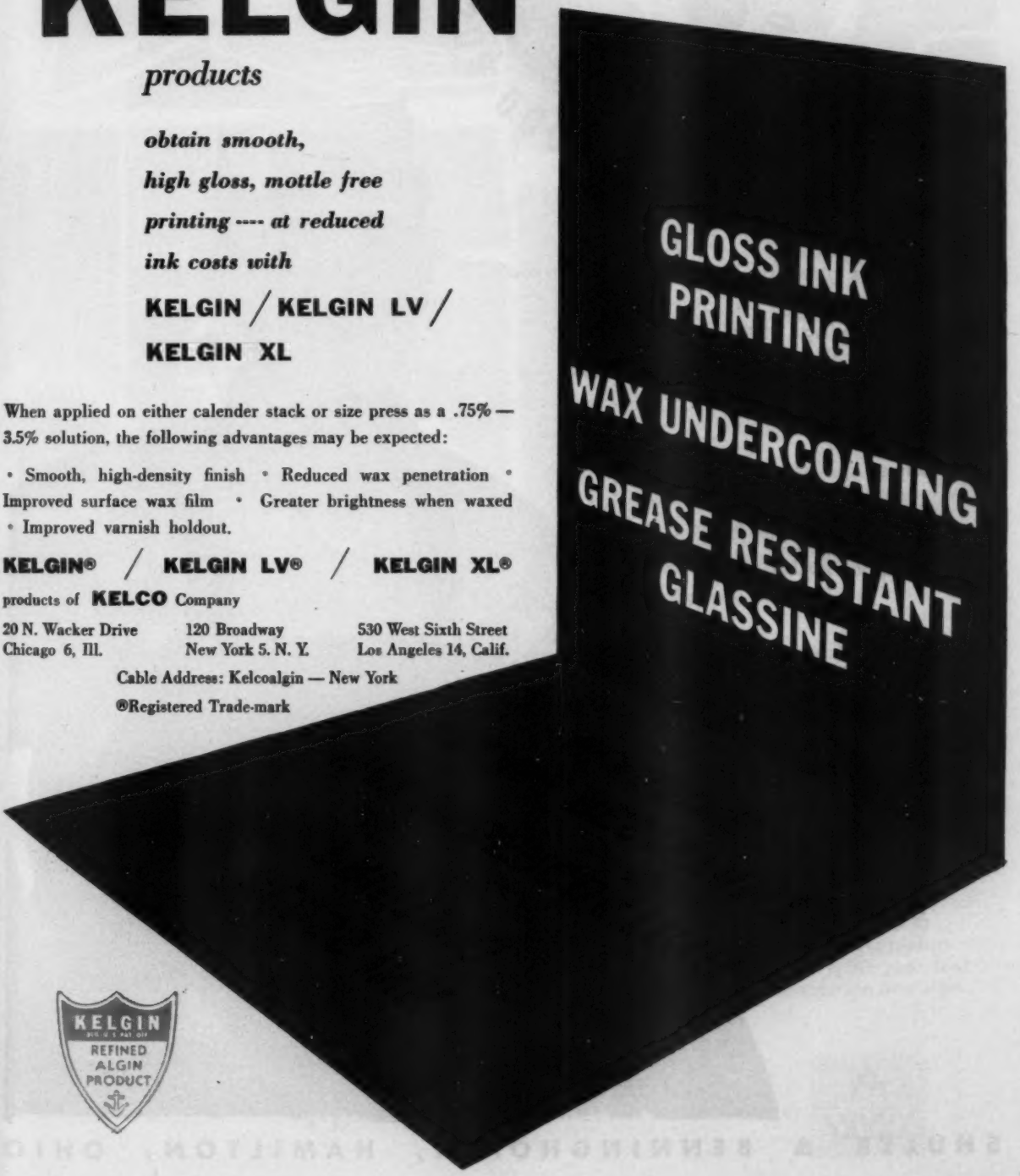
120 Broadway, New York 5. N. Y.
530 West Sixth Street, Los Angeles 14, Calif.

Cable Address: Kelcoalgin — New York

®Registered Trade-mark



KELGIN
REFINED ALGIN PRODUCT

GOOD PAPERS FOR GOOD BUSINESS

W. C. HAMILTON + SONS MIQUON, Pa.

HAM FELTZ says:

"Whatever is good for business is good for you."

From the drawings of the designer to the check that pays the bill, good business needs good paper.

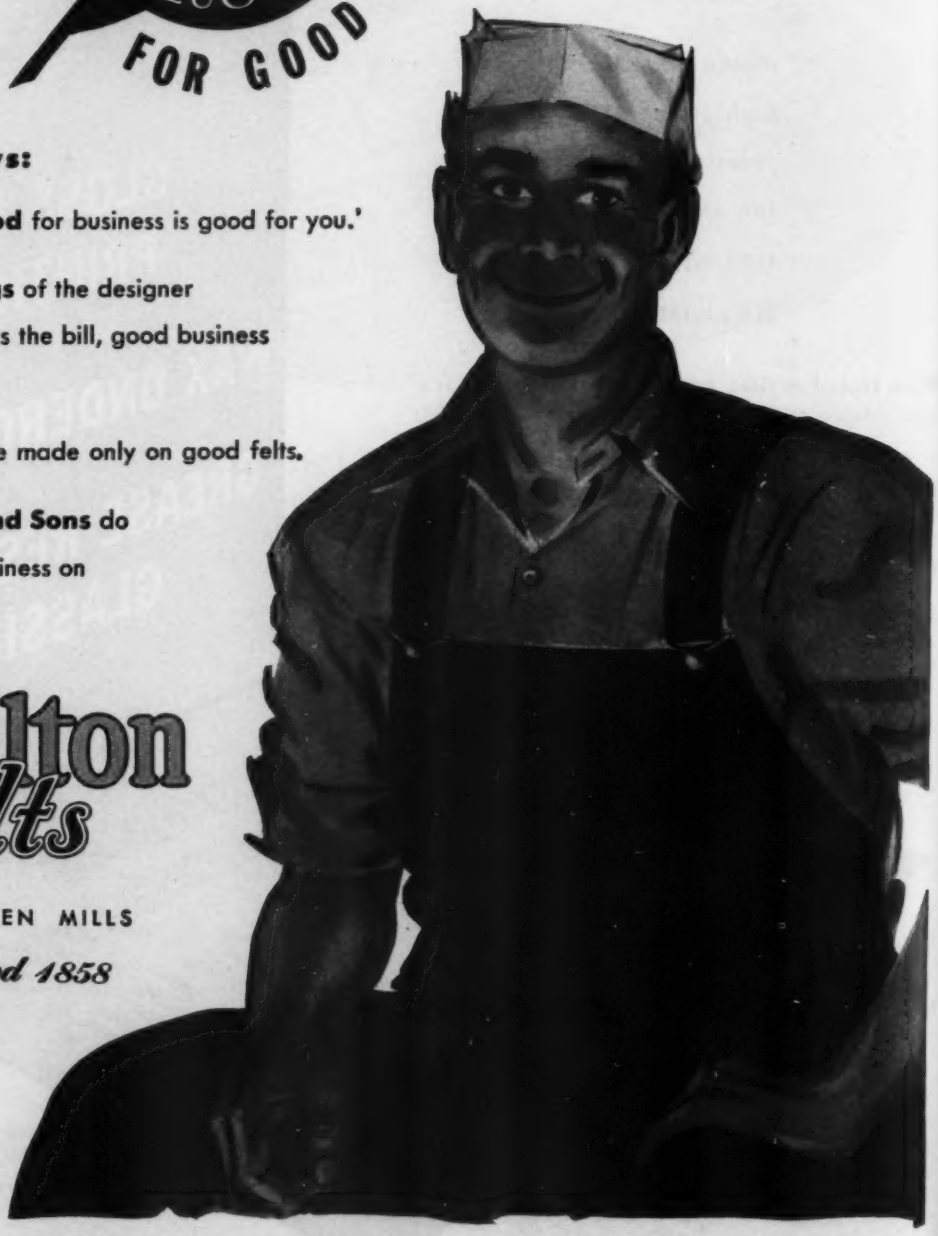
Good paper can be made only on good felts.

W. C. Hamilton and Sons do consistently good business on

Hamilton Felts

MIAMI WOOLEN MILLS

Established 1858



SHULER & BENNINGHOFEN, HAMILTON, OHIO

Paper helps make it "good business today"

General Offices, Appleton, Wisconsin

Plants at Appleton, and Montgomery, Alabama.

Business is booming, and business papers preserve essential records. Deeds and contracts—orders and acknowledgements—checks and invoices—forms for every situation... creating order where all might be chaos—contributing to clarity, communication, and efficiency—minimizing errors to protect buyer and seller, property and production, and keep business thriving.

And in at the start of business papers—in every field where paper goes to work... Fourdrinier wires. Appleton Wires. Good wires—by a 59-year test of industry-wide acceptance and use.

Appleton Wire Works, Inc.

Battery of Jones Majestic Jordans at Weyerhauser's Longview, Wash., board mill. This popular high-capacity machine accounts for a large percentage of Jones Jordan sales.

Big enough to do the job required of it! — and the Jones line of eight sizes, from Midget to Leviathan permits selection of exactly the right size and type to meet every requirement.

Built into *all* Jones Jordans are exclusive features developed from more than a century of service to paper mills, which provide maximum operating efficiency, ease of maintenance and low operating cost.

Ask your Jones representative for more information, or write today for Bulletin EDJ-1007A.

E.D. Jones

E. D. Jones & Sons Company
Pittsfield, Massachusetts

BUILDERS OF QUALITY STOCK PREPARATION EQUIPMENT

In Canada: The Alexander Fleck Limited, Ottawa

"SAVINGS in operation and maintenance first year were *more* than cost of four Yarway Digester Blow Valves"

THAT was the experience of a large Florida mill after they installed YARWAY Seatless Motor Operated Blow Valves on their digesters.

Clean, fast blows eliminated production delays. Expensive liquor loss from leaking valves ended. Remote control of motor operation reduced operating costs.

Continued satisfaction has resulted in installation of additional YARWAY Digester Valves for expanded plant facilities.

Such records are not unusual and new features like the YARWAY 17/4 PH stainless steel plunger and automatic lubricator, combined with improved operating control, make YARWAY Seatless Digester Blow Valves an even better buy today.

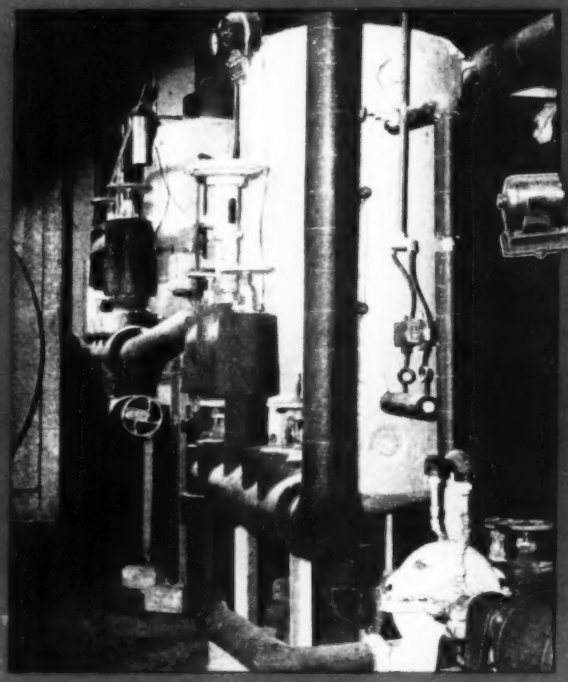
You may choose between hydraulic-cylinder or electric motor operated valves, all remotely controlled.

For the full story on Yarway Seatless Digester Blow Valves write for this free Bulletin B-440.

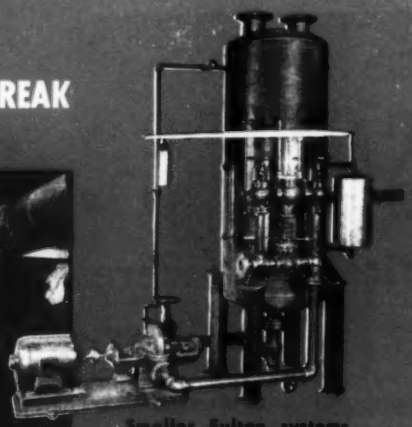
YARNALL-WARING COMPANY
149 Mermaid Avenue, Philadelphia 18, Pa.
BRANCH OFFICES IN PRINCIPAL CITIES

YARWAY digester blow valves

GIVE YOUR DRYER SECTION A BREAK



Recently installed Fulton system on big, fast Fourdrinier in the South.



Smaller Fulton systems rapidly being installed on older and on smaller machines.

Fulton Dryer Drainage systems have been installed on practically every paper machine built in the past ten or fifteen years. Go back a little further and include older and smaller machines, and the total soars to some 900 installations.

Why are FDD systems in such general use—what do they do to rate such widespread acceptance?

Automatic control of drying operation
Proper graduation of temperatures
Substantially faster drying
More uniform drying clear across the sheet
Less broke—far less broke
Less shrinkage, cockling, curling or hardening regardless of grade

If yours is one of the comparatively few dryer sections still handicapped for lack of Fulton Dryer Drainage, get in touch with us at once. Give your dryer section a break.

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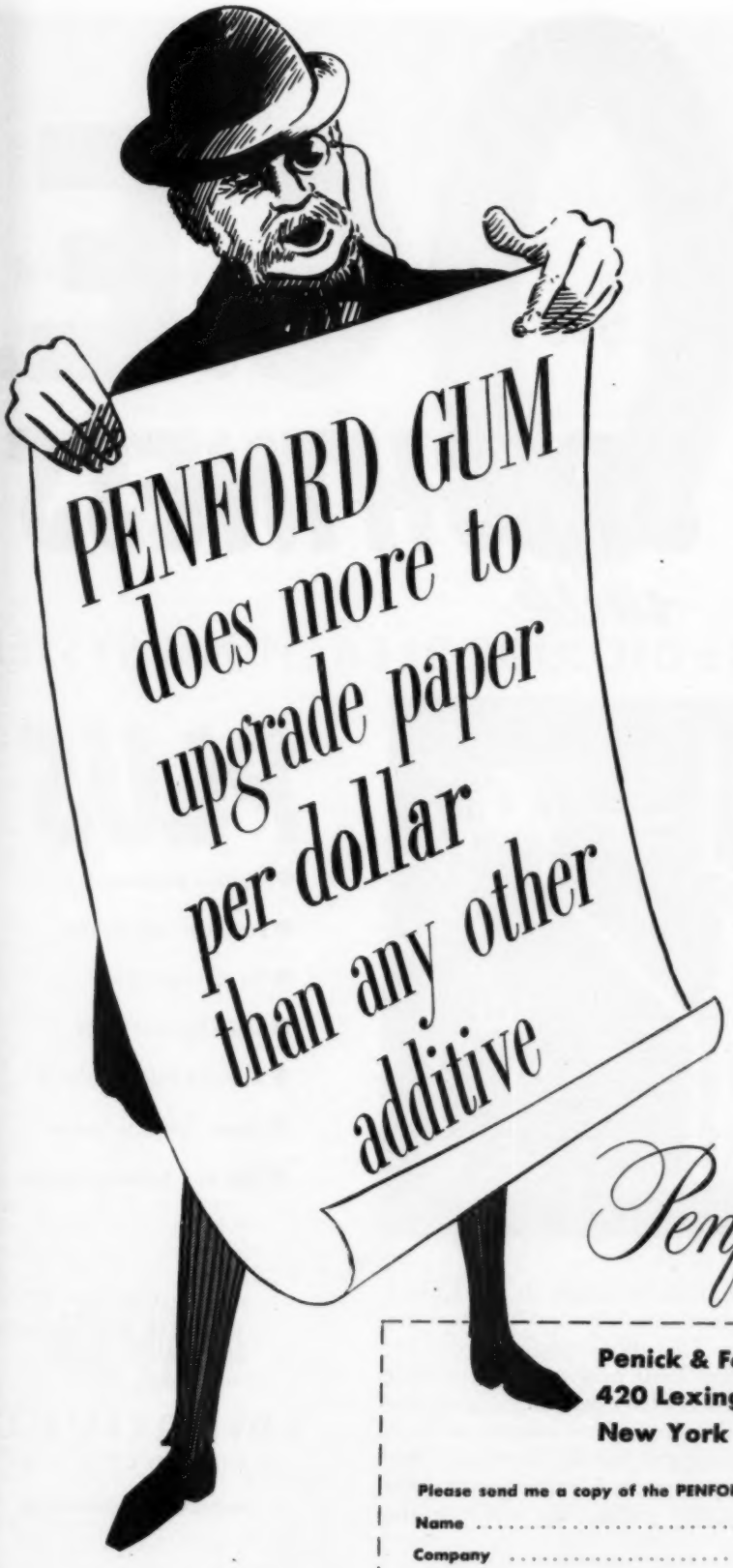

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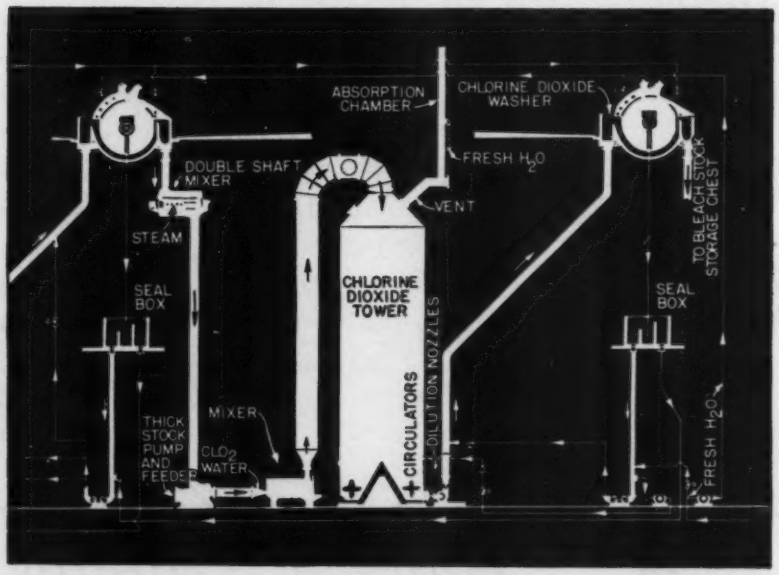

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With the advent of chlorine dioxide bleaching in the United States, IMPCO studied the problem carefully and tailored the first working high density system. This pioneering unit was installed in a prominent mid-southern kraft mill with outstanding results. Since that time IMPCO systems have gone into operation on soda, sulphite and semi-chemical pulp. This continuous high density process has produced successful results from the very beginning and today 22 IMPCO systems are bleaching over 6000 daily tons of high brightness quality pulps. We welcome the opportunity to work with you.

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CURRENT COMMENTS

Newsprint at saturation . . . an end to recession . . . and OTC

That the North American production of standard newsprint has practically reached a point of saturation as far as consumption demand is concerned was indicated in a recent field day before a Congressional committee.

Russell C. Flom, assistant administrator of the Business and Defense Services Administration of the Department of Commerce, told the House Committee on Interstate and Domestic Commerce that recent developments indicate that for the time being at least newspaper publishers in the southern states are reasonably well supplied from existing mills. With Canadian mills on a six-day basis it would be readily possible to expand output to a seven-day basis if the demand increased.

Mr. Flom said that in the last few years a larger part of the increased domestic needs is being met and will be met in the future from domestic production. He called attention to the recent announcement that International will build a mill at Mobile, which would bring capacity to 1,885,000 tons of domestic output by the end of 1957. Present capacity is almost twice that of nine years ago, and the announcement that an Arkansas plan for further production has been dropped at least temporarily is indication that such a proposed new mill could not get sufficient customer commitments to justify its erection.

Effect of new techniques

A major factor in the changed picture is the rapid development of techniques for the pulping of hardwoods, which add a tremendous potential additional supply of raw material. Present usage of hardwoods is over 2,000,000 cords more than five years ago.

Tree farms and forestry programs are another factor in increasing the available supply of pulpwood. The industry now owns 30,000,000 acres of timberlands maintained under good forestry management. Mr. Flom said:

"Our studies, based upon facts and reliable information, indicate that newsprint production capacity in the United States and elsewhere in the world is increasing at a steady rate. On the basis of our estimates it would appear that, for at least the next year or two ahead, supply and demand should be in reasonable balance."

This is a different picture than the one Congressman Celler of New York has been painting in the newsprint investigation conducted by his own Congressional committee.

A short-lived slump

A prominent columnist has announced, as a big story overlooked by most newspapers, the fact that the 1954 recession of business is over, and that the national economy is beginning to set new records. This is definitely the case in the paper industry. This columnist says that the recent slump was one of the most short-lived and least severe in American economic history. With the upsurge in the paperboard field, the paper industry's over-all picture through the first quarter of the year is a most encouraging comparison with the first quarter of 1954.

The larger paper mills are evidencing this trend toward increasing prosperity by contracts for expansion, and by a continuance of a merging of smaller plants into the major units for the sake of more efficient production and distribution. More and more, these mergers indicate a trend on the part of the manufacturers of basic paper to assume a greater measure of participation in the utilization of converting organizations, thus making the industry a more homogeneous whole from the forest to the consumer.

A striking example of this trend is the decision of a great paperboard company to enter the basic wrapping and kraft paper manufacturing field, including a shift to bag production to dovetail into its packaging field, hitherto principally in the box area.

One variant from this absorption of marketing and converting agencies by the paper manufacturers is the reversed program by a large converter to control the mill which had provided its basic paper.

Another trend which has apparently reached its peak is the program of various newspaper publishers to insure their paper supply by the purchase and operation of old mills most frequently known for the production of papers other than newsprint.

Foreign trade

The next battle in Congress bearing on the paper industry will be the foreign trade program of the Eisenhower Republicans. The Senate has withheld action on the bill to extend the President's authority to enter into new reciprocal trade agreements pending the introduction of a measure to tie this country more closely into the international agency, better known as GATT. Subject to Congressional approval, the State De-

No Money from Publishers

Reference was made on this page in the March issue of THE PAPER INDUSTRY to Bowaters Southern Paper Corp. at Calhoun, Tenn. It was stated that this mill had been made possible by investments of newspaper publishers. The statement was in error.

In a letter from K. O. Elderkin, vice president and general manager of Bowaters Southern, it has been stated that, "Bowaters is the first newsprint mill built in the South which does not depend in any way on investment of newspaper publishers. The only capital in this mill is equity capital supplied by the Bowater organization from its own resources, and money borrowed from banks and insurance companies."

Current comments . . .

partment's representative at Geneva has signed the documents which would set up a new functional body for the control of international trade. This organization is known as the Organization for Trade Cooperation, which will become best known as OTC. This program, however, is certain to meet lusty opposition from those elements in both houses of Congress which are fighting against any form of delegation of tariff-making powers to any agency other than Congress itself. The feeling of these elements is that even the present powers of the President should be curtailed instead of extended.

The guaranteed annual wage

General prosperity is still advancing. The only fly in the ointment is the beginning of negotiations in the automotive industry for the granting of a guaranteed annual wage to the workers. This threat has so far had no perceptible impact on the optimistic atmosphere prevalent in the nation. Pending a possible strike, however, the pressure for production and sales of automobiles has never been so acute. All records are being broken by the minor as well as the major units in this field.

Financial Reports

Securities markets were subject during the month of March to some wide fluctuations, but the results were not widely different, as to price levels, from those of a month ago. Paper securities averaged slightly lower than in the earlier months of the year.

Net incomes

Celotex Corp.—Net income for three months ended January 31 was $746,539, as against $315,489 for the comparable period a year ago.

Continental Diamond Fibre Co.—Net 1954 income was $244,749, as against $826,673 for 1953.

Dixie Cup Co.—Net 1954 income was $3,528,923, as compared with $2,751,752 in 1953.

Gaylord Container Co.—Net income in 1954 was $7,001,129, as compared with $7,705,782 in 1953.

Hammermill Paper Co.—Net 1954 income was $1,637,379, as compared with $1,541,398 a year previous.

International Paper Co.—Net income in 1954 was $67,475,584, as compared with $58,542,518 in 1953.

Masonite Corp.—Net income for the quarter ended February 28 was $2,069,407, as against $787,139 for the comparable quarter a year ago.

Oxford Paper Co.—Net income in 1954 was $3,408,192, as against $2,700,299 in 1953.

River Raisin Paper Co.—Net income for 1954 was $656,985, as compared with $720,847 in 1953.

St. Regis Paper Co.—Net income for the first quarter of 1955 was $4,129,968, as compared with $3,949,456 in the same quarter of 1954.

West Virginia Pulp & Paper Co.—Net income for four months ended February 28 was $3,816,000, as compared with $3,209,000 in the comparable period a year ago.

Paper mill corporate changes

Brown Co. has arranged for the redemption of outstanding $5 preferred shares as a plan for simplifying the corporate structure.

National Container Corp. has planned an additional common stock issue of 250,000 shares and a seven million dollar issue of debentures to provide about ten million dollars for plant expansion, increased working capital and general corporate purposes.

Riegel Paper Corp. is planning, subject to stockholder approval, extensive financing. It is planned to increase the par value of a reorganized common stock authorization from $5 to $10 per share and to allow stockholders to exchange each share of the old stock for one and one-half shares of the new issue. Also contemplated is the sale of $15,000,000 in sinking fund debentures to authorize the sale of additional common stock to present stockholders. The new funds will redeem the company's outstanding funded debt and preferred shares and help finance the company's $5,000,000 southern pulp mill.

Stock and Bond Quotations

New York Stock Exchange — Stocks

Closing Prices	April 11,1955	March 10, 1955
A.P.W.	5	5⅛
Celotex	29¾	30¼
Same Pref.	19½	19¼
Certain-Teed	24	25⅛
Champion P & F	52	54
Same Pref.	*106-107½	106
Chesapeake Corp.	46	46½
Container Corp.	64½	64
Same Pref.	*102½-104	*101½-103
Continental-Diamond	21	18
Crown Zellerbach	70¾	66⅛
Same Pref.	...	104¾
Dixie Cup	56½	56½
Eastern Corp.	27	24⅜
Federal Paper Board	36½	36
Robert Gair	29¼	28¾
Gaylord Container	36½	33½
Great Northern	78¾	79½
Hammermill	30¼	25⅞
International	88¾	88½
Same Pref.	105	*103½-105
Kimberly-Clark	47¼	46⅛
Same Pref.	...	183
MacAndrews & Forbes	52	*50-51½
Marathon	33¼	31½
Masonite	29⅜	29¾
Mead Corp.	61⅜	55
Same Pref.	*105-106	*102½-103¼
Same Sec. Pref.	68	*61-64½
Minnesota & Ontario	57¾	58
National Container	15⅞	15
Same Pref.	27¼	26½
Oxford Paper	43½	37⅛
Same Pref.	97¾	55½
Rayonier Inc.	76	68¾
Same Pref.	38¼	40
Rhinelander	32	33¼
Scott	61¾	61⅜
Same $3.40 Pref.	*96½-97½	*96¼-97
Same $4.00 Pref.	*106-107	*105½-107
St. Regis	40⅜	36
Same Pref.	103½	*101⅞-102½
Sutherland	52½	54
Union Bag & Paper	76	76
United B. & C.	20½	18⅜
United Wall Paper	2⅜	2½
Same Pref.	19¾	*18½-19
U.S. Gypsum	238	225
Same Pref.	*180-182¼	...
W. Va. P. & P.	43	39
Same Pref.	*107-108	*107-107¾

New York Stock Exchange — Bonds

Celotex 3¼'s	...	...
Champion P. & F. Co.	...	...
Mead Corp. 2¾	...	...

American Stock Exchange — Stocks

American Writing	18½	18⅜
Brown Co. Common	16¼	15½
Same $5 Pref.	114¾	110
Puget Sound	...	48

*Closing Bid and Asked Prices.

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In Canada: Canadian Titanium Pigments Limited, Montreal 2; Toronto 1.

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The Paper Industry

MAY 1955

The moving-interface mechanism of pulping

THE MECHANISM OF alkaline pulping proposed by W. J. Nolan and G. R. Kulkarni, as published in this issue, is based on a reaction interface which moves toward the center of the chip with the progress of the delignification or pulping process. This means that delignification is complete on the liquor side of the interface, is in progress at the interface, and has not yet started on the inward side of the interface.

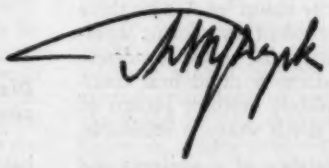
Nolan and Kulkarni's results are impressive, and their arguments demand recognition. The evidence presented shows that there is no appreciable penetration of alkali into the chip ahead of the moving interface. While pre-evacuation of the chips, prior to cooking, resulted in an increase of absorbed alkali in the chips during cooking, the depth of penetration of alkali, even under these conditions, was only moderate and no increase in the depth of delignification could be observed.

These results are also dramatically portrayed in a series of color photomicrographs of phloroglucinol-stained thin sections of cooked wood blocks which clearly show the progress of delignification.

Since the interface mechanism of pulping is in direct conflict with the penetration mechanism, which until now has never been seriously challenged and which is the basis for the Va-Purge process developed at the Pulp and Paper Research Institute of Canada (see July, 1953, issue of THE PAPER INDUSTRY), the publication of this paper is bound to touch off a wide-spread controversial response. It will create a need for a critical re-evaluation and reinterpretation of results on both sides with the view to eventual overall reconciliation of scientific data and experimental observations.

From an engineering and production standpoint, many readers will ask, "what is the practical significance and application of the moving-interface mechanism of pulping?" Since practical applications follow only after exhaustive experimentation carried out in the wake of the new knowledge gained, it is too early to present an adequate evaluation of the proposed mechanism for such a purpose. There is, however, one obvious conclusion we can draw from the results, namely, that the interface mechanism of pulping will establish an even greater need than was hitherto thought desirable for increasing the surface area of the chips in order to achieve maximum productivity in pulp and papermaking.

One way of achieving a greater surface area is by pre-shredding the chips prior to cooking—a practice which fortunately is outside the realm of controversy relating to the two mechanisms of pulping. For the beneficial effects of pre-shredding chips prior to cooking are recognized by the proponents of both the penetration and the moving-interface mechanisms.



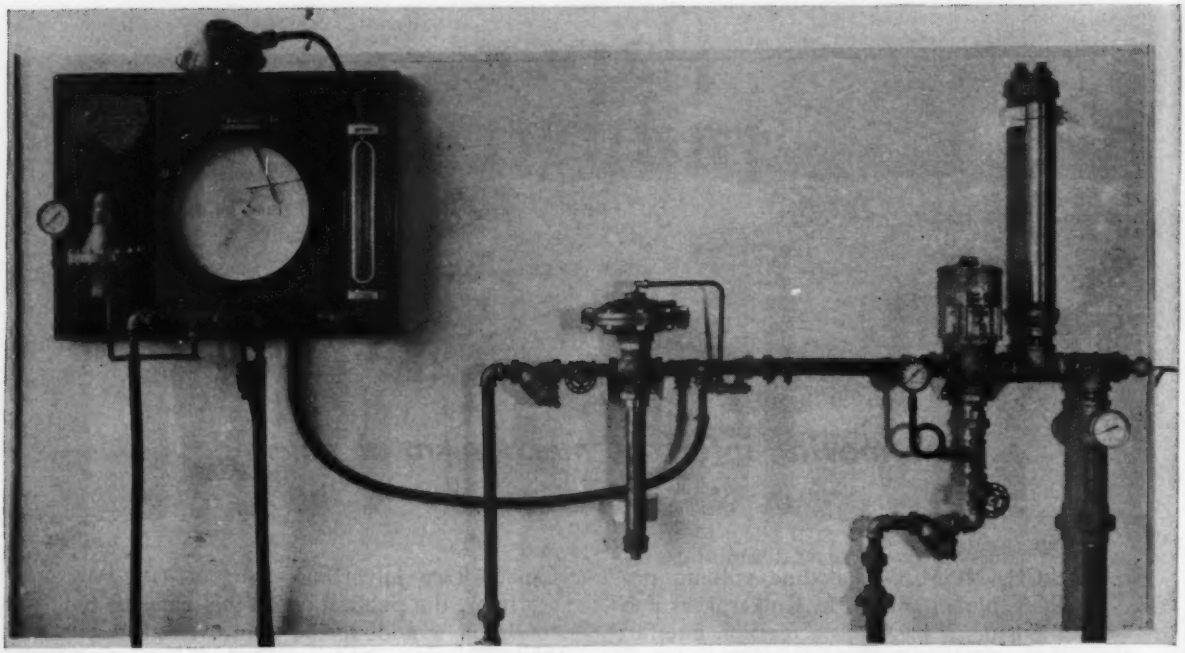


Fig. 1—Pictured from left to right are test panel assembly of the control group, water regulator, and cooker group. New units are so assembled for trial and adjustment before shipment to a paper mill

A continuous starch cooker proves itself

- A method has been developed for continuous precision cooking to any desired degree of starch properties
- The uniformity of the cooked slurry, containing no degraded fraction, shows markedly increased effectiveness and new applications in papermaking

IN OUR MAY, 1954, Focus Issue (devoted to Increased Productivity through the use of Modern Equipment) we expressed the need, among others, for a continuous starch cooker which still had to be developed. This requirement apparently has now materialized with the development of the continuous jet cooker by A. E. Staley Manufacturing Co.

In this jet cooker, the entire stream of the starch slurry is formed into a uniformly flowing film which is then brought in direct contact with a high velocity steam jet. Under these conditions—marked by violent agitation, instantaneous steam condensation, and extremely rapid heat transfer—a completely uniform pattern of heating the starch slurry is attainable.

The importance of a uniform and controllable pattern of starch slurry heating is readily understood when we consider the series of changes that take place in the starch granule above the critical temperature of about 150° F involving viscosity, solubility, granular size changes and, finally, in the absence of accurate control, a breakdown of the granules into smaller particles with a corresponding loss of papermaking effectiveness.

In the jet cooker, the starch passes through the heating zone only once. There is no danger of overcooking or of consequent granular breakdown. The cooking to any desired degree of starch properties is completed within a second.

Disadvantages of conventional cooking

The main difficulty in conventional batch and tank cooking is the nonuniform progress of the cooking pattern. Since conventional cooking involves a relatively narrow hot zone at the point of greatest heat transfer, where cooking progresses very rapidly, and a large comparatively cool zone in the rest of the tank, where cooking lags behind, there can be little uniformity in the degree of cooking attained by the individual starch particles, with a consequent wide variety in properties shown by the individual starch particles that make up a conventionally cooked starch slurry.

In batch cooking, it is customary to cook relatively concentrated slurries in order to keep the size of tanks and the volume of the starch slurry to a minimum. This results in highly concentrated starch pastes which are difficult to handle and to disperse uniformly, often causing spots and flecks in the paper sheet.

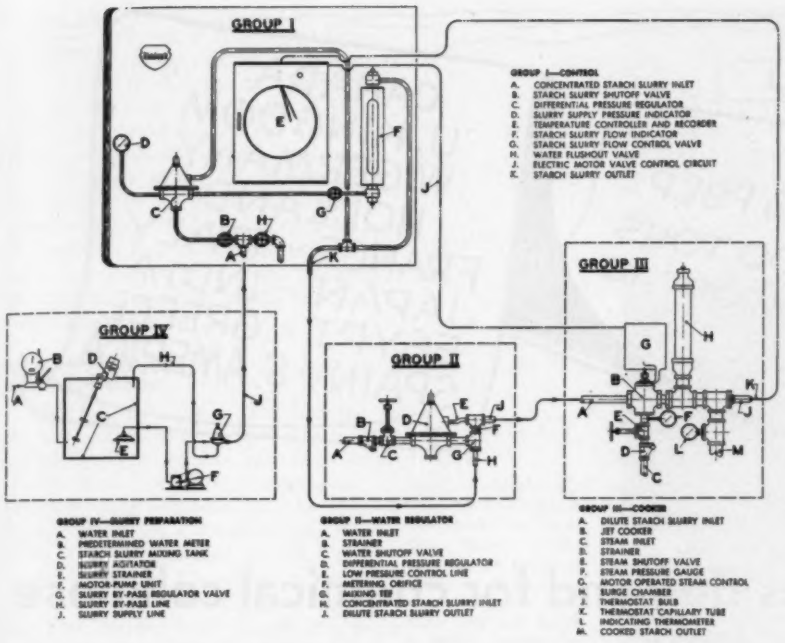


Fig. 2—The four functional groups making up the Staley jet system for continuous cooking of starch applied in papermaking include: (I) control panel, (II) water regulator, (III) jet cooker, and (IV) slurry preparation

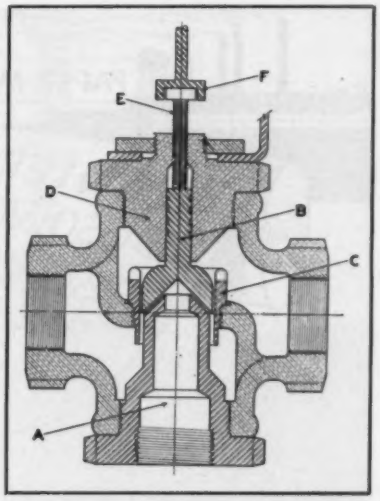


Fig. 3—A cross section of the jet cooker used in the Staley continuous cooking system. The jet is housed in a body casting of a conventional single seated globe valve

In batch cooking, the practice has been to add the cooked starch batchwise at the beaters or refiners. This has resulted in great loss of desired properties in starch additives due to the mechanical refining and hydration action in the beaters and refiners.

Advantages of continuous jet cooking

As already stated, continuous jet cooking permits accurate and controlled cooking to any desired degree of starch properties. This is an extremely important accomplishment since different grades of paper may require different degrees of starch properties for maximum productivity and quality.

Continuous cooking permits the use of low starch concentration which results in operating convenience and insures complete and uniform dispersion. Since, with continuous cooking, starch is added after the stock refining operation, there is no loss of starch properties due to the mechanical refining and hydration action in the beaters and/or pulpers. In the same application, it has been found that the jet cooker is, on the average, 30 per cent more effective, compared with the fresh batch cook.

The properties of the starch slurry are so intimately associated with the cooking temperature that a change of only a few degrees in the continuous starch cooker can produce noticeable effects in the operation of the paper machine, as well as in the physical tests of the paper sheet.

An important general effect of the jet cooker is the increase in retention of all additives, such as clays, chalk, pigments, fine fibers, and even starch itself. This increase in retention may be a temporary pickup until a new system balance is reached, or it may be used to obtain a permanent increase in ash content when the required loading material is supplied. On one highly loaded sheet, the same total filler was obtained with a 25 per cent reduction in starch, compared to the best previous cooking methods.

It has also been observed that rapid cold water quenching of the cooked paste is important. In this connection, there is some evidence that the starch has a selective tendency to pick up and bond into the sheet the nearest solids in the stream at the time of quenching. This has led to certain operating practices in which fillers and pigments are mixed with the supply starch slurry and fed through the continuous cooker with the starch.

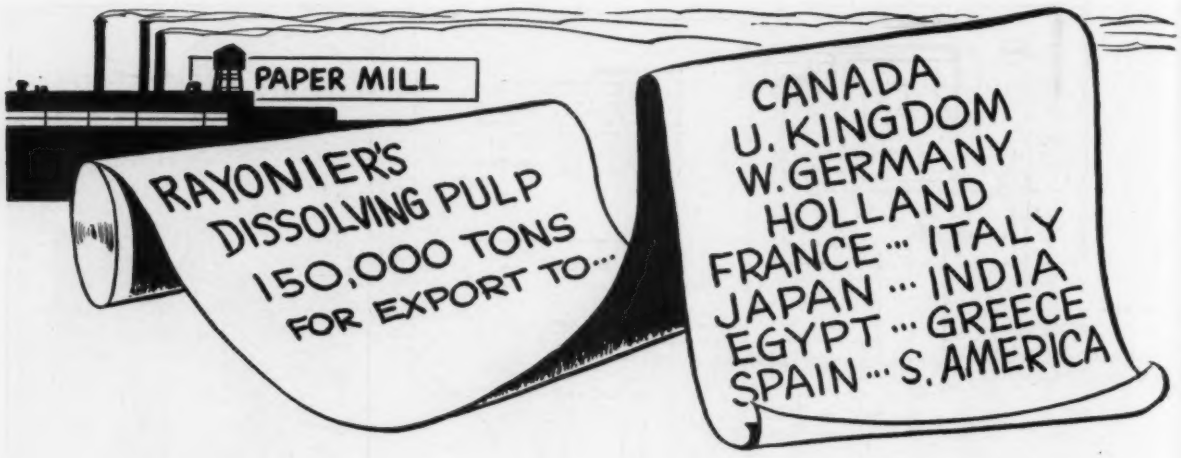
A second general effect obtained through continuous jet cooking is the increase in paper strength, as measured by the Mullen test. Although the pickup of fines and filler tends to weaken the sheet, there has often been an increase of ash content in the paper without loss of strength. Thus, an increase of 20 per cent Mullen was obtained on an index stock containing 25 per cent rag, when compared with beater starch addition under identical conditions. On a heavy kraft test liner, Mullen was increased by more than 10 per cent with a starch addition of 1.5 per cent and no reduction in machine speed.

One of the most spectacular effects of the jet cooker is the control of apparent stock freeness by regulation of cooking temperature. This is best shown by experiments in which the cooker is started at low temperature, which is then slowly increased. At some critical temperature, which varies with the type of furnish, there is a sharp increase in the vacuum reading of suction boxes and suction couch rolls. The change may involve 1—2 in. vacuum, brought about by a change of only a few degrees in cooking temperature. This regulation of apparent stock freeness makes it possible to hold formation of the sheet while decreasing the power applied to jordans and refiners, thereby improving tear tests.

Description of the continuous cooker

Two sizes of commercial units, with maximum cooking capacities of 300 and 1200 lb. of starch per hour, respectively, and at concentrations not exceeding ½ lb. per gal., have recently been made available to the paper industry. The accuracy of temperature control in these units under normal conditions of operation is in the range of two degrees. This precision in accuracy involves not only good thermostatic equipment but also

(Continued on Page 151)



Growing overseas demand for chemical cellulose

▶ Rayonier Inc. states some reasons for this demand and how it is meeting it

INDUSTRIAL NATIONS abroad are finding it more advantageous to import chemical cellulose than raw cotton, both for their own needs and for textile exports.

Rayonier Inc., principal United States exporter of this highly refined wood pulp, says its overseas shipments in 1954 more than doubled those in 1953. The 1954 exports were around 24 per cent of the company's total chemical cellulose sales for that year. Purchasers included Canada, the United Kingdom, Holland, France, Italy, West Germany, Japan, Egypt (which raises cotton), India, Greece, Spain, and South America.

United States most economic source

The United States is the only real economical source of the free world for large imports of chemical cellulose. Scandinavia, the chief other exporting country, has reached the limit of its production. For future expansion, it cannot compete with a North American country that has a faster wood pulp growth cycle.

While South America and Africa may be promising sources of cellulose in the distant future, at present they are only potential competitors, says Rayonier's president.

Revival of textile industry overseas

Revitalization of cellulose-using industries in Japan and in Europe, particularly in West Germany, is contributing to the increasing demand for cellulose abroad. To keep their textile mills running, these countries and others will have to expand their imports of necessary fiber.

A factor in the renewal of the textile manufacture abroad is the improved standard of living. Says Clyde B. Morgan, president of Rayonier: "The standard of living of the peoples of the free world outside of North America is rising and will continue to rise. As these two billion people raise their standards of living, one of their first steps will be increased consumption of textile fibers."

Efficiency of United States cellulose production

One reason for the increased United States exports of chemical cellulose is the efficiency of production in this country, which is bringing down costs below those of exporters overseas.

For example, the total projected chemical cellulose capacity of the free world for 1955 is about 3,000,000 tons. Of this amount, Rayonier has a production potential of around 700,000 tons, or close to 20 per cent. Each of its five plants, located at Shelton, Hoquiam, and Port Angeles, Wash., and at Fernandia Beach, Fla., and Jesup, Ga., averages about 116,000 tons total annual capacity. Besides, it has another approximate 150,000 tons capacity from Alaska Pine & Cellulose Ltd., Canada, where it recently acquired 80 per cent of the stock.

Capacity can be doubled at any time at the new Jesup plant, by doubling the whole production line.

Dollar exchange savings

Dollar-for-dollar and pound-for-pound, overseas purchasers get about 3½ to 4 times as much value from imported chemical cellulose as from cotton or natural fiber for use in their textile mills. If they import cotton for this purpose, they pay in dollars at the current rate of about 35 to 40 cents a pound, whereas low-cost cellulose costs around 10 cents a pound. In other words, they use only approximately one-fourth as many dollars per pound of finished product when they buy cellulose as when they purchase raw cotton.

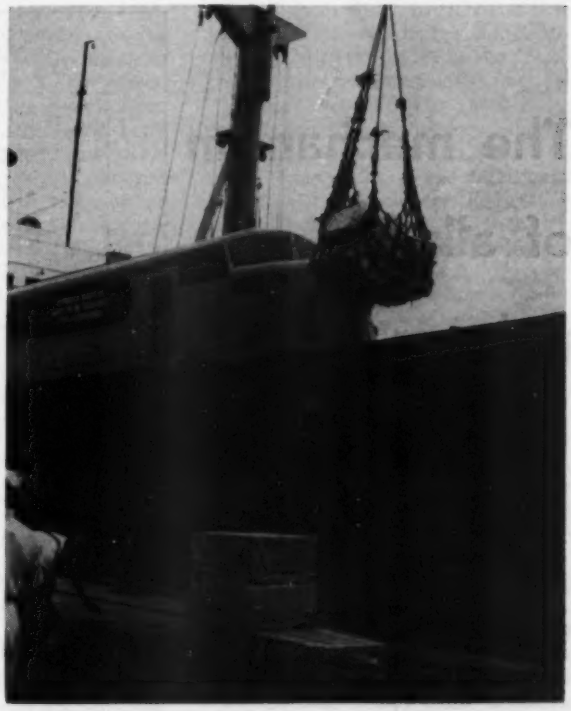
An example of how an overseas importer of chemical cellulose for use in textile manufacturing can make a good profit, or enough to justify the original expenditure of short American dollars, is as follows:

Japan can buy a ton of the artificial fiber from the United States at the present time for about $165. This ton is then processed to yield at least a ton or more of rayon, depending upon the efficiency of the processing. In

turn, Japan can take this ton or more of rayon and sell it as an exportable product outside the country for around $800 currently. If Japan had imported natural fiber for her purposes, she would have paid almost four times as much per ton and could not make profit enough on the finished product to justify her original expenditure. Proof of this is that since World War II, Japan, as well as many other countries, has converted a large number of its cotton spinning plants to rayon manufacturing plants.

Less speculation in artificial fiber

Chemical cellulose is not handled on the commodity exchange, while cotton is. The reason for this, of course, is that cellulose is not an unprocessed raw commodity like the natural fiber, but a finished one. Because it is not handled on the commodity exchange, it is subject to much less U.S. speculation and price variation than cotton. Even though it is a basic industrial world commodity, chemical cellulose exercises a price control which natural fiber sold as raw material cannot.



First chemical cellulose from Rayonier's new plant in Jesup, Ga., moves toward overseas chemical cellulose users from Savannah's state docks. Here, the first batch is being loaded in June, 1954, aboard the S. S. Rodero bound for Argentina

Rayonier's stable price policy

Rayonier has led the way in instituting a stable price policy for chemical cellulose exports from the United States. In this way, it has helped increase the overseas demand. Its policy is contrary to the "what the market will bear" method.

The company feels that whipsaw price fluctuations are wholly unjustified. It observes, for example, that in one period of nine or ten years, world cellulose sold for as little as $120 a ton and as much as $900 a ton for the same product, with absolutely no change in it.

Rayonier sets prices in relation to the cost of processing the wood pulp and making a fair profit. Even if the demand for chemical cellulose overseas results in a short supply, the company will not for this reason increase its price unless its manufacturing cost increases; and if the demand for the artificial fiber decreases and produces a free supply, Rayonier will not markedly lower its price unless its manufacturing cost lowers.

Importers of cellulose abroad like this stable price policy, and on this account will buy from Rayonier when a competitor in Europe may be selling at substantially lower price.

Research an important factor in added U.S. exports

Helping explain the increase in United States exports of chemical cellulose overseas is the emphasis this country puts on research in order to insure continuity of quality to customers.

At Rayonier, the manufacturing and export operations are so highly integrated with research that the company does not make a major move without consulting this department. The company is not only concerned with continued research in the processing of chemical cellulose from wood pulp, but also in methods used by overseas purchasers of cellulose in manufacturing textile products.

Rayonier spends over $1 million annually on chemical cellulose research alone, which is probably the largest sum expended yearly anywhere for just this study. The company has a laboratory for this purpose only at Shelton, Wash.

Supplying world-wide technical service promotes exports

Along with its extensive research program, Rayonier has a technical service team of consultants who travel anywhere in the world and advise customers, who desire the service, without charge, how to get the best use from chemical cellulose. These men point out ways to increase both efficiency and economy in the manufacturing process that converts cellulose into rayon and finished products. Members of the team are chiefly chemical engineers and chemists with doctors' degrees.

Inter-communication between U.S. and foreign executives

Also, high Rayonier executives are constantly in touch with the responsible executives of companies importing cellulose from the United States. This direct liaison extends through all levels of management, and the resulting co-ordination of interests is an indirect factor in increasing cellulose exports overseas.

Increase in overseas exports calls for new capital investment

Another way Rayonier has taken a leading position in promoting demands abroad for chemical cellulose from the United States is by anticipating these needs with new capital investment to improve plant production and capacity.

From 1946 through 1954, this firm invested $80 million in new and improved facilities.

President Morgan puts it this way: " A company in our business must be prepared to put down $25 or $30 million at a crack to build new cellulose mills as needed."

And he adds: "The world demand for chemical cellulose has been steadily increasing, and Rayonier still foresees a continued growth of the cellulosics — rayon, acetate, cellophane, tire cord, several important plastics, etc. — for many years to come."

The mechanism of alkaline pulping*

G. R. KULKARNI† and W. J. NOLAN‡

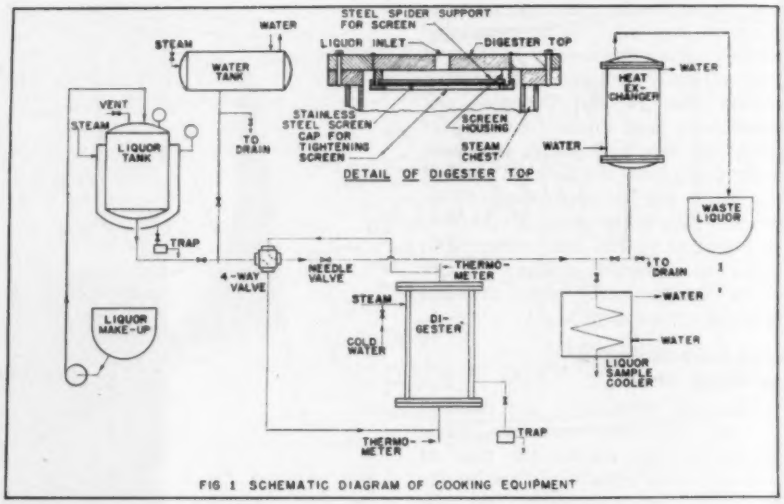


FIG 1 SCHEMATIC DIAGRAM OF COOKING EQUIPMENT

▶ A new concept of the mechanism of pulping is presented, as opposed to the generally accepted penetration theory

▶ Results and color photomicrographs of the reaction zone indicate that delignification is accomplished by a reaction interface which moves toward the center of the chip

▶ Alkali does not appreciably penetrate the chip ahead of the moving interface and pre-evacuation before cooking does not increase the depth of the delignification

A THOROUGH ELUCIDATION of the mechanism of wood pulping, by any method, is rendered difficult by the complex physical and chemical nature of wood and its reactions with the cooking chemicals. Since the primary purpose of pulping is the delignification of wood, a study of the mechanism of any pulping process resolves itself into a study of the reactions between lignin and cooking chemicals and the solution of the products of the reactions.

Our lack of knowledge as to the exact chemical constitution of lignin precludes any theoretical attack on the problem on the basis of its chemical nature. Hence, the research methods usually employed are based on studies of the effects of the cooking variables, such as time, temperature and concentration, on the rate of delignification and on the interpretation of these results on the basis of the laws of kinetics. Such methods were used in the investigation into the mechanism of sulfate pulping, to be described in this presentation.

In the past, numerous authors have conducted research toward this same goal of explaining the mechanism of the process, but the final, complete answers have yet to be obtained. Brauns and collaborators (1) (2) (3) conducted extensive research toward the clarification of the chemical reactions involved in the delignification process, but their results were incomplete. Ahlm (4), Hensen (5), Enkvist (6), Enkvist and Hagglund (7), etc., have shown that the acceleration of the rate of delignification by the presence of sodium sulfide in the alkaline cooking liquor is due to the formation of easily soluble thiolignin. The acceleration of the rate of delignification by increases in liquor ratio and concentration was reported as early as 1914 by Surface (8). Later, in 1923, Bray and Andrews (9) and Wells, Grabow, Staidl and Bray (10) concluded that the over-all cooking reaction is most rapid in the early stages of the cook. They stated that during this period cellulose decomposition is more rapid than that of lignin. Kable, McKee and Simmons (11), in a study of the effect of wood chip size, found that a variation in chip length from ½ in. to 1½ in. did not affect the quality of pulp. This was followed by a very interesting study by Mitchell and Ross (12) in 1931, who, by the use of constant high alkali concentration, were able to produce aspen pulps comparable in strength to spruce sulfite.

The first attempt to study the mechanism of wood pulping was made by Sutermeister (13), who found a linear relationship between the wood removed and sodium hydroxide consumed. Arrhenius (14), in 1926, found a first order reaction to hold for the data of Bruun (15), even though these data were not obtained at constant concentration. Ruby (16) constructed an alignment chart for the data of Bruun (15) and Hagglund (17). Later, however, in 1929, Bray (18) and Lewis and Laughlin (19), as a result of a much more extensive research program, concluded that the first order law does not apply to the pulping process. Mitchell, Potter and Ross (20), by maintaining constant liquor concentration, showed that in the early stages of cooking the rate of removal of carbohydrate is faster than that of lignin. Late in the cook, however, the reverse was found to be true. These findings were substantiated by Macklin, Ross and Maass (21), who found that the reaction between lignin and alkali takes place in two stages, the first stage forming an insoluble alkali-lignin which is made soluble in the second stage. Nolan and McCready (22), Larocque and Maass (23), and Jayme and Goddard (24) have shown that, although the rate of reaction between wood and caustic soda closely approximates that of a first order reaction, the reaction is actually heterogeneous and any analysis based on the laws for reaction of definite order is purely empirical. De-

*Submitted as partial fulfillment of the Ph. D. degree in chemical engineering, University of Florida, Gainesville, for G. R. Kulkarni, and presented at the 1955 TAPPI annual meeting.

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viations from the first order law are particularly serious during the period in which the last 2 — 3 per cent of lignin is being removed. Larocque and Maas (23), working with data of Lusby and Maass (25), showed that the change in rate of delignification with temperature follows the Arrhenius equation, with an energy of activation of 32,000 calories per gram-molecule. Bixler (26), through a microscopic study of partially cooked wood sections, found that alkaline cooking liquors, both sulfate and soda, have a selective action and react with the highly lignified intercellular material before there is any noticeable action on the slightly lignified secondary cell wall.

Pulping procedure

In order to evaluate each of the controllable variables as exactly as possible, it is necessary to design the cooking equipment so that each of the variables can be changed while all the others are held constant. The variables involved are temperature, concentration, per cent sulfidity and time. Liquor ratio and per cent chemical must be ignored in such a study because large excesses of liquor must be used to insure constant concentration throughout the cook.

The equipment is shown schematically in Fig. 1. The various units are operated as follows. About 30 gal. of liquor of the proper concentration are prepared in the liquor make-up tank and pumped to the liquor storage tank. The liquor is brought to the required steam pressure through the use of the steam jacket. Temperature is observed by means of a thermometer placed in a well, not shown. Pressure gauges are provided for easy observation on both the tank and its steam jacket.

Liquor flows from the tank, through the 4-way Merco-Nordstrom cock, into the bottom of the digester. This liquor flows from the top of the digester back through the 4-way cock to the heat exchanger, where it is cooled to a temperature lower than 200°F and is finally collected in the waste liquor tank. Direction of flow through the digester is periodically reversed by turning the 4-way cock through 180°.

Only one digester is shown in the sketch. Another digester, with duplicate piping, is provided so that two cooks can be carried out simultaneously. At the top and bottom of each digester, thermometers are in direct contact with the liquor. Steam-tight joints are provided at these points by means of rubber stoppers held under compression with pipe fittings.

Each digester is made from a section of 4 in. dia. steel pipe, 6¾ in. long. The steam jacket is made from 6 in. dia. pipe The construction of digester top and bottom are identical, shown in detail in Fig 1. The screen used on top and bottom is made from 100 mesh stainless steel backed up by 20 mesh screen and a rigid spider support. The digester top is removed for charging and discharging by means of eight ⅜ in. stud bolts. Rate of flow of liquor through the digester is controlled by a ½ in. stainless steel needle valve in the liquor exit line.

A wash water tank is provided so that water at slightly higher steam pressure than that used in the cook can be used for washing out the digester at the end of the cook. Steam in the digester steam jacket is replaced by cold water immediately after the hot water has been forced into the digester. Thus, each cook can be terminated almost instantaneously.

A liquor sample cooler, shown at the right of Fig. 1, is provided to insure substantially constant concentration during the cook. Preliminary tests showed that, under the most rapid cooking conditions, a flow of 200 ml. per min. insured a concentration drop of less than 1.0 per cent. During each cook, liquor is sampled at this point to insure substantially constant concentration throughout the cook.

A typical cook is carried out as follows. The liquor tank and hot water tank are brought to the steam pressure at which the cook is to be carried out. About 15 min. before the start of the cook, the steam jacket of the digester is brought to operating pressure. The wood sample is placed in the digester, and the cover is bolted in place. Liquor from the storage tank is admitted to the bottom of the digester and flows through the system, leaving at the waste liquor tank. Upward flow of liquor through the digester insures complete removal of air at the start of the cook.

The needle valve, regulating flow of liquor, is opened wide for the first two minutes of the cook. This procedure insures that the temperature inside the digester has reached full cooking temperature within 1.0 — 1.5 min. of the start of the cook. Thereafter, the needle valve is throttled to a flow of 200 ml. per min.

Normally, at the end of a cook, the liquor supply is cut off and is replaced with water from the wash water tank. The steam supply is cut off from the digester jacket and is replaced with cold water. As soon as the digester is cooled, the cover is removed and the sample is ready for analysis. Such procedure is preferable to blowing the digester charge, as it insures that the sample retains its original form and facilitates complete removal. The procedure is sufficiently rapid so that the cook can be terminated almost instantaneously.

When wood blocks are being cooked and it is planned to evaluate the liquor concentration in the block, the digester discharge procedure must be modified. In such cases liquor flow is stopped by cutting off both the liquor supply valve and the needle valve. Cold water replaces steam in the digester jacket. The needle valve is then opened slowly, allowing digester pressure to decrease gradually. When cool, the digester is opened and the sample is removed for analysis.

In a few cases, vacuum impregnation of wood blocks was studied. In these studies, about 200 ml. of water are placed in the digester and the wood block is placed on a removable false bottom above the water surface. The digester cover is bolted in place and steam is admitted into the digester jacket. No liquor is admitted to the digester. As pressure develops in the digester, the needle valve is opened for 15 - 20 seconds, allowing steam and air to escape. The needle valve is closed, allowing pressure to build up for 2 - 3 min. The digester is again exhausted by opening the needle valve. This procedure is repeated several times until it is assumed that practically all noncondensable gases have been purged from the block. Liquor is then admitted to the digester in the usual manner.

Preparation of wood samples

Two slash pine trees, about 8 in. d.b.h., were cut at Austin Cary Memorial Forest, sawed into 4 ft. lengths and debarked by hand. These logs were preserved until needed by submerging in a water solution of sodium pentachlorophenate at a concentration of 0.7 per cent. This procedure prevented mold growth and avoided the development of cracks in the wood structure.

For most of the pulping studies, the logs were sawed lengthwise on a band saw into strips. These strips were then reduced to various thicknesses on a planer. Thicknesses used were 0.035, 0.070, 0.120, 0.180, 0.220, 0.260 and 0.280 in. The wood strips were stored for several days in the constant temperature room until they had reached constant weight. They were then cut into 2½ by 2½ in. squares. Equilibrium moisture was evaluated by drying several samples. Each air dry sample was weighed. Some of these samples were cooked in the air-dry state, while others were water-soaked after weighing and then cooked.

These 2½ by 2½ in. squares of varying thickness were used in studying the effect of time, temperature, and concentration on rate of delignification. For the later studies on concentration gradients across the wood specimen, wood cubes 2 by 2 by 2 in. were used. These cubes were submerged in the penta-chlorophenate solution until removed for cooking. This was done to prevent cracking or checking of the blocks. For each block cooked, an identical specimen was dried at 105°F to constant weight. The thin squares will be referred to subsequently as thin chips, while the 2 by 2 by 2 in. cubes will be called blocks.

Analyses of cooked samples

In the study involving the pulping of thin chips, the partially cooked chips were washed overnight with hot water to remove all black liquor, dried at 105°C, and weighed to constant weight. From these data, per cent yield was calculated. Each sample was then analysed for lignin according to TAPPI Standard No. 222.

In the study of large blocks, each of the cooked blocks was split along the grain into parallel strips about 1/6 in. thick. In this manner, six strips were obtained from the outer edge of the block to the center. Splitting was accomplished by means of a 3 in. putty knife ground to a sharp edge. This method, while not too satisfactory in producing strips of uniform thickness, gave the best results of all the methods tried. The cross-sectional strips were designated, from the outer edge to the center of the block, as Sections A, B, C, D, E and F, respectively.

Each of these strips was subjected to successive boilings with hot water until all alkali had been extracted. All of the extracts for each section were combined, made up to standard volume and titrated for total alkali, active alkali and sulfide, according to TAPPI Standard No. 625. Each of the extracted sections was dried at 105° C, ground, and analyzed for lignin as described above.

The second half of each block was thoroughly extracted with hot water and subdivided into nine small blocks, each 1 by 2/3 by 2/3 in. These blocks were used for microscopic study. Several techniques were tried in order to observe the degree of delignification in the sections. In the first attempts, very thin sections were obtained with a razor blade and examined under the microscope, using both reflected and diffracted light. Unevenness of the sections prohibited clear focusing on the specimen.

Best results were obtained by using a sliding microtome to cut the sections. Very fine, thin slices were obtained from sections into which cooking had not penetrated thoroughly. However, in the areas where delignification was nearly complete, the slices tended to fall apart. It was found

Table I—The Delignification of Thin Sections of Slash Pine

(Each section was 2.5 X 2.5 in. square. Liquor flow rate in all cooks was 200 ml. per min. Cooking liquor of 25% sulfidity was used throughout.)

Chip Thickness (in.)	Chip Condition	Liquor Conc. (gpl Na_2O)	Cooking Temperature (°C.)	Cooking Time (min.)	Weight of Oven Dry Sample (gms.)	% Wood Dissolved	% Lignin in the Undissolved Wood	% of Original Lignin Remaining in Undissolved Wood
0.035	Water-soaked	76.5	180	25	1.85	51.0	15.4	27.0
0.070	Water-soaked	76.5	180	25	3.52	50.4	15.5	27.5
0.120	Water-soaked	76.5	180	25	8.31	50.0	15.7	28.0
0.180	Water-soaked	76.5	180	25	10.50	48.2	15.2	28.1
0.220	Water-soaked	76.5	180	25	14.09	47.0	15.7	29.7
0.260	Water-soaked	76.5	180	25	16.50	45.8	16.3	31.6
0.280	Water-soaked	76.5	180	25	16.75	44.2	17.3	34.5
0.070	Air-dried	76.5	180	25	3.95	37.1	21.1	47.5
0.120	Air-dried	76.5	180	25	8.18	36.9	20.7	46.8
0.180	Air-dried	76.5	180	25	10.88	35.7	20.7	47.6
0.240	Air-dried	76.5	180	25	14.65	32.6	23.7	57.0
0.280	Air-dried	76.5	180	25	15.80	30.8	25.2	62.2
0.120	Water-soaked	76.5	180	15	6.28	19.7	31.0	89.0
0.120	Water-soaked	76.5	180	25	6.45	50.0	15.7	28.1
0.120	Water-soaked	76.5	180	30	6.54	55.3	11.0	17.6
0.120	Water-soaked	76.5	180	40	6.28	62.0	8.3	11.3
0.120	Water-soaked	76.5	180	50	6.90	68.1	6.8	7.7
0.120	Water-soaked	76.5	180	60	7.01	70.2	5.0	5.3
0.120	Water-soaked	76.5	180	70	6.57	73.8	4.4	4.2
0.280	Water-soaked	76.5	180	15	16.05	13.5	32.3	59.5
0.280	Water-soaked	76.5	180	25	16.23	44.2	16.5	38.0
0.280	Water-soaked	76.5	180	30	15.15	48.0	14.1	36.1
0.280	Water-soaked	76.5	180	40	16.08	55.2	11.0	17.6
0.280	Water-soaked	76.5	180	50	15.65	60.1	7.8	13.0
0.280	Water-soaked	76.5	180	60	17.50	62.2	7.5	10.1
0.280	Water-soaked	76.5	180	70	15.85	65.0	4.8	7.8
0.120	Water-soaked	76.5	125	25	6.93	14.0	31.3	96.1
0.120	Water-soaked	76.5	140	25	6.39	18.2	31.1	91.0
0.120	Water-soaked	76.5	159	25	7.24	28.2	26.2	67.0
0.120	Water-soaked	76.5	180	25	7.21	45.8	15.8	30.6
0.120	Water-soaked	76.5	190	25	7.06	57.1	9.1	13.8
0.120	Water-soaked	76.5	131	40	5.82	18.0	31.0	91.0
0.120	Water-soaked	76.5	150	40	6.36	25.0	27.5	73.7
0.120	Water-soaked	76.5	170	40	6.20	46.3	16.3	31.3
0.120	Water-soaked	76.5	180	40	6.45	61.8	7.2	9.8
0.120	Water-soaked	76.5	190	40	7.21	82.5	5.2	3.2
0.120	Water-soaked	30.0	180	25	6.08	30.0	24.5	61.0
0.120	Water-soaked	45.0	180	25	6.22	37.1	21.6	48.7
0.120	Water-soaked	60.0	180	25	6.04	42.5	18.2	37.5
0.120	Water-soaked	76.5	180	25	7.33	50.0	15.7	28.1
0.120	Water-soaked	90.0	180	25	6.64	52.0	13.7	23.5
0.120	Water-soaked	30.0	180	40	6.42	38.1	20.0	44.2
0.120	Water-soaked	45.0	180	40	6.09	44.1	16.0	32.0
0.120	Water-soaked	60.0	180	40	6.17	52.1	12.8	22.0
0.120	Water-soaked	76.5	180	40	7.10	58.3	9.3	14.1
0.120	Water-soaked	90.0	180	40	6.22	62.0	8.0	10.8

FIG. 2. EFFECT OF CHIP THICKNESS ON WOOD AND LIGNIN REMOVAL.

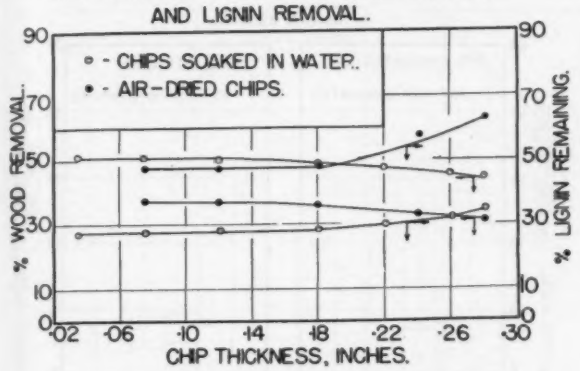


FIG. 3. EFFECT OF COOKING TIME ON WOOD & LIGNIN REMOVAL.

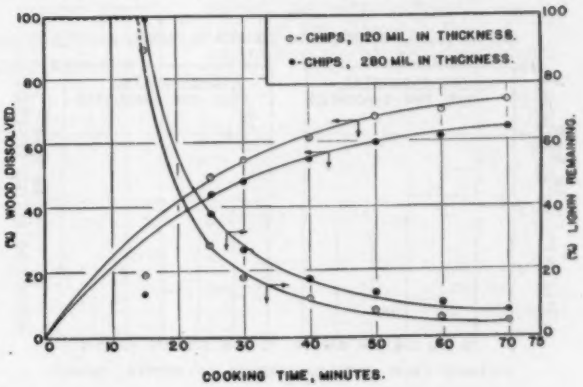


FIG. 4. EFFECT OF TEMPERATURE ON WOOD & LIGNIN REMOVAL.

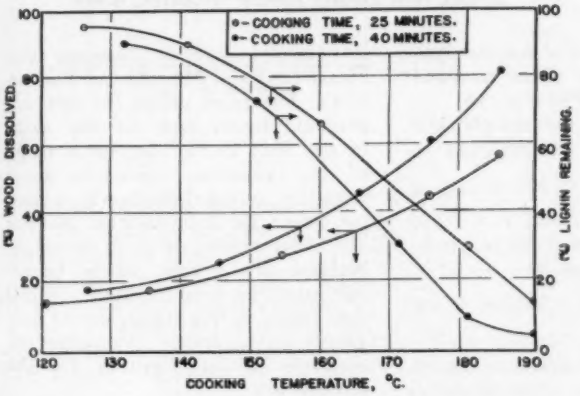
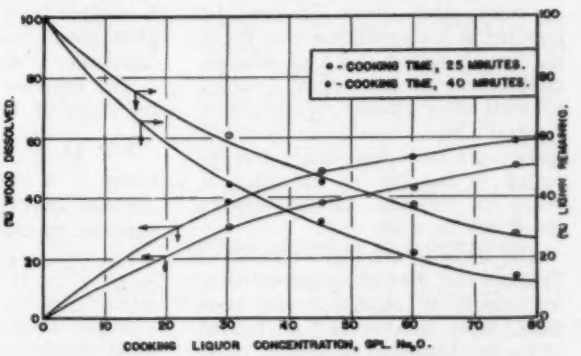


FIG. 5. EFFECT OF ALKALI CONCENTRATION ON WOOD & LIGNIN REMOVAL.


o - COOKING TIME, 25 MINUTES.
• - COOKING TIME, 40 MINUTES.
% WOOD DISSOLVED.
% LIGNIN REMAINING.
COOKING LIQUOR CONCENTRATION, GPL. Na2O.

that by cutting along the grain, after many attempts, a few slices could be obtained in the delignified area. All attempts to preserve these sections in either water or 50 per cent alcohol were futile, as the sections disintegrated.

The very thin sections were stained with a 1 per cent solution of phloroglucinol, as described in Johansen's text (27), and examined under the microscope, using diffracted light. Color photomicrographs of representative samples were taken immediately after the examination.

Presentation of data

All of the cooking data for thin chips are presented in Table I. In this study, the range of variables was as follows: chip thickness, 0.030 to 0.28 in.; cooking time, 15 to 70 min.; temperature, 125 to 190° C., each temperature at 25 to 40 min.; concentration, 30 to 90 g.p.l., expressed as Na_2O, all at 25 per cent sulfidity.

The effect of chip thickness is shown graphically in Fig. 2, while Fig. 3 shows the effect of cooking time on wood and lignin removal. The influence of temperature on wood removal and delignification is presented in Fig. 4. Fig. 5 is a similar representation of the effect of cooking liquor concentration.

The data resulting from the pulping of wood blocks are listed in Table II. From these data the following concentration gradients are plotted; Fig. 6 for free NaOH and Na_2S; Fig. 7 for active and organic alkali, and Fig. 8 for the lignin gradient across the blocks. In all cases, the data for blocks cooked with and without pre-evacuation are included.

Part I
The Pulping of Thin Chips

Effect of chip thickness

Fig. 2 shows that, for the particular values of time, temperature, and concentration studied, the extent of wood removal and delignification are constant for chip thicknesses in the range between 0.030 and 0.120 in. As chip thickness increases beyond this point, both wood removal and delignification for the over-all chip decrease.

If either temperature or concentration had been increased, the thickness range over which the constancy of wood removal and delignification occurred might have been greater. This same increase in thickness range might possibly have been achieved by a decrease in cooking time from the constant time of 25 min. These data indicate the importance of chip size in any study of the mechanism of pulping. This phase of the study should be expanded so that the effect of thickness and the other cooking variables can be evaluated simultaneously.

The effect of moisture content in the chip is shown strikingly in this same Fig. 2. About 13 per cent more wood and 20 per cent more lignin are removed when water-soaked chips are used instead of air-dry chips, for chip thicknesses up to 0.120 in. At thicknesses greater than 0.120 in. the difference in wood removal remains about the same, while the difference in delignification becomes slightly larger. The fact that lignin and other woody materials are more easily dissolved from the wet chips by alkali cannot be readily explained at this time.

The importance of chip thickness is further emphasized by the data shown in Fig. 3. Both the over-all reaction and the removal of lignin are increased by decreases in chip thickness. For example, to attain a yield of 50 per cent, about 25 min. are required when chips are 0.120

FIG. 6.

ACTIVE ALKALI GRADIENT IN COOKED BLOCKS.

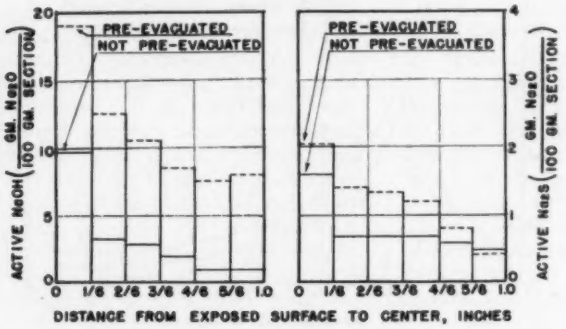
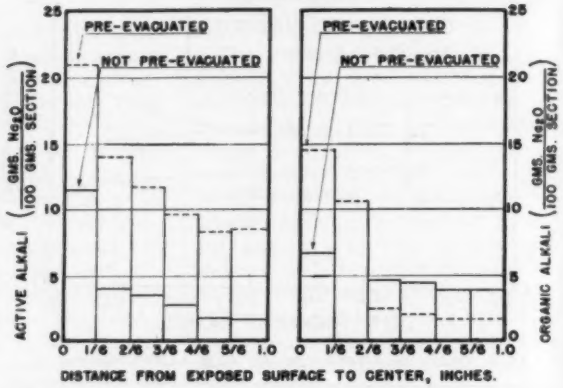

PRE-EVACUATED
NOT PRE-EVACUATED
PRE-EVACUATED
NOT PRE-EVACUATED
ACTIVE NaOH (GM. Na2O / 100 GM. SECTION)
ACTIVE Na2S (GM. Na2O / 100 GM. SECTION)
0 1/6 2/6 3/6 4/6 5/6 1.0
DISTANCE FROM EXPOSED SURFACE TO CENTER, INCHES

FIG. 7. ACTIVE AND ORGANIC ALKALI GRADIENTS IN COOKED BLOCKS.


PRE-EVACUATED
NOT PRE-EVACUATED
PRE-EVACUATED
NOT PRE-EVACUATED
ACTIVE ALKALI (GMS. Na2O / 100 GMS. SECTION)
ORGANIC ALKALI (GMS. Na2O / 100 GMS. SECTION)
0 1/6 2/6 3/6 4/6 5/6 1.0
DISTANCE FROM EXPOSED SURFACE TO CENTER, INCHES.

in. thick, while about 32 min. are required at a chip thickness of 0.280 in. The increased speed of reaction must be due to the surface involved since all other cooking variables were constant. More than twice as much surface per unit chip weight was involved in the case of the chips of 0.120 in. thickness, as compared to the 0.280 in. thick chip.

The shape of the lignin-time curve indicates that the early stages of cooking should be examined very carefully. More data points are needed in the neighborhood of 15-min. cooking time. Even though roughly 20 per cent of the wood has been dissolved in 15 min., the lignin curve shows that lignin removal is very slight. The lignin curve must be defined more accurately in this range before the mechanism of delignification in the very early stages of the cook can be explained.

Effect of cooking time

If the rate of delignification follows a definite order of reaction, there must be a definite correlation between cooking time and the amount of lignin remaining in the wood. The arithmetic plot of cooking time, θ, against per cent of original lignin remaining, L, (Fig. 3) appears to result in a hyperbolic curve. When these variables are replotted on semi-logarithmic paper (Fig. 9), straight lines fit the data for cooking times up to 40 min. Beyond 40 min. the data points follow lines of lesser slope. Such a situation immediately suggests that the subtraction of a constant from the ordinate, L, might cause the data to fall on a single straight line.

By trial and error it was found that if constants of 3.0 and 5.0 for chips of 0.120 and 0.280 in. thickness, respectively, were subtracted from the values of lignin remaining, L, straight lines resulted for the complete cooking range. This modified correlation is shown in Fig. 10.

The equation of the straight line for chips of 0.120 in. thickness is,

$$\text{Log } (L - 3) = K\theta + \log a$$

where $K = -0.027$ and $a = 97.0$. The line for chips of 0.280 in. thickness can be expressed by

$$\text{Log } (L - 5) = -0.021\theta + \log 95.0$$

These equations indicate that a small amount of the lignin in wood is not removed through the mechanism which causes removal of the main body of the lignin. This unavailability of a small part of the lignin for reaction has been reported by other investigators, such as Larocque and Maass (23) and Mitchell and Yorston (28). The exact values for this unavailable lignin and for the slope of the lines in Fig. 10, for a range of chip thicknesses, cannot be stated from the existing data. As was pointed out earlier, the delignification data for very short cooking times, in the neighborhood of 15 min. should be investigated in greater detail. Several data points in this region should help greatly in accurately evaluating the constants in the equation for the straight line.

The empirical correlation developed above suggests that delignification, up to about 97 per cent of the original lignin, is accomplished by an apparent first order reaction.

FIG. 8. LIGNIN GRADIENT IN COOKED BLOCK.

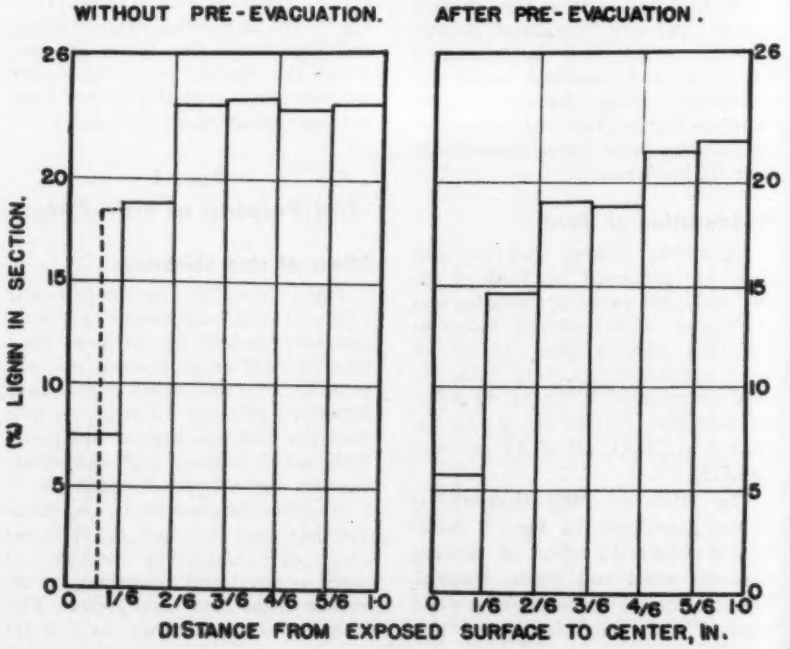

WITHOUT PRE-EVACUATION.
AFTER PRE-EVACUATION.
(%) LIGNIN IN SECTION.
0 1/6 2/6 3/6 4/6 5/6 1.0
DISTANCE FROM EXPOSED SURFACE TO CENTER, IN.

FIG. 9. RELATION BETWEEN DELIGNIFICATION AND COOKING TIME.

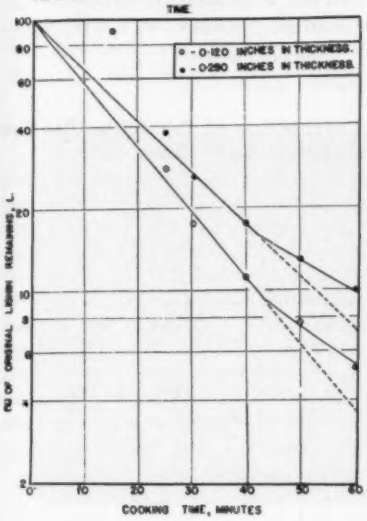
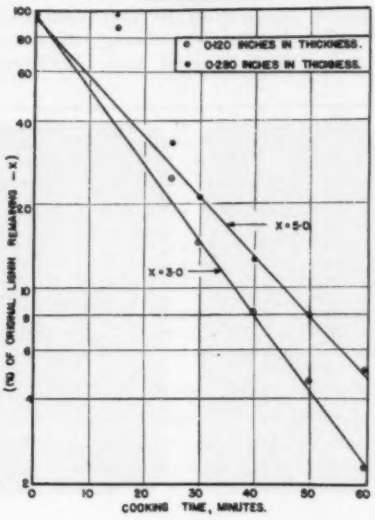


FIG. 10. DERIVED RELATIONSHIP BETWEEN DELIGNIFICATION AND COOKING TIME.



Effect of cooking temperature

In the equation for chips of 0.120 in. thickness or less,

Log $(L - 3) = (-K)\theta + \log a$

K represents the velocity constant at a time, θ, when the per cent of the original lignin remaining is L. Equation I can be expressed for any time, θ, as

$$\frac{-dL}{d\theta} = K(L-3) \qquad (I)$$

in which K is the reaction velocity constant. It should be pointed out that, even though the equation for a first order reaction is used, it must be considered only as an apparent first order reaction. The complexity of the process makes a true first order reaction highly improbable.

Rather than search for an empirical correlation between delignification and temperature it was decided to investigate a possible relationship between velocity constant and temperature, in accordance with the standard Arrhenius equation. The Arrhenius equation states that:

$$\text{Log } K = \text{Log } A - \frac{B}{T}$$

in which K is the velocity constant, T is the absolute temperature and A and B are constants for the particular chemical reaction. According to this equation, a plot of velocity constant on a logarithmic scale against 1/T should result in a straight line.

Using the data in Table I for cooking times of 25 and 40 min. and various temperatures, velocity constants were calculated as follows. Equation I can be rearranged as follows:

$$K = -\frac{1}{\theta}\log\frac{(L-3)}{97} = \frac{1}{\theta}\log\frac{97}{(L-3)} \qquad (II)$$

From the appropriate experimental data, the following constants were calculated.

These velocity constants were plotted semi-logarithmically against 1/T and are shown in Fig. 11. The equation of the straight line relationship is:

$$\log K = \log (1 \times 10^{10}) - \frac{5250}{T}$$

or,

$$K = (1 \times 10^{10})\ (e)^{\frac{-24100}{RT}} \qquad (III)$$

In accordance with the general theory of chemical activation, this value of 24,100 cal. per gm.-molecule, or

$$\frac{24100}{6.03 \times 10^{23}} = 4.0 \times 10^{-20} \text{ cal. per mol.}$$

should be the activation energy for the chemical reaction between lignin and alkali. This value is in excellent agreement with the activation energy of 32,000 cal. per gm.-molecule or 5.3×10^{-20} per molecule as calculated by Larocque and Maass (23) from the experimental data of Lusby and Maass (25).

Effect of liquor concentration

The cooking data in which liquor concentration varied (Table I) were studied to establish the relationship between velocity constant and con-

Cooking Temperature (°C.)	(°K.)	$\frac{1}{T}$	θ	$\frac{1}{\theta}$	L	$\frac{97}{L-3}$	Velocity Constant (K)
125	398	0.00251	25	0.040	96.1	1.04	0.00071
140	413	0.00242	25	0.040	91.0	1.10	0.00169
159	432	0.00231	25	0.040	67.0	1.52	0.00722
180	453	0.00220	25	0.040	30.6	3.51	0.02180
190	463	0.00216	25	0.040	13.8	8.98	0.03820
131	404	0.00248	40	0.025	91.0	1.10	0.00104
150	423	0.00238	40	0.025	73.7	1.37	0.00342
170	443	0.00226	40	0.025	31.2	3.44	0.01340
180	453	0.00220	40	0.025	9.9	14.03	0.02870
190	463	0.00216	40	0.025	3.3	323.0	0.06250

FIG. 11. RELATIONSHIP BETWEEN VELOCITY CONSTANT AND $1/T$.

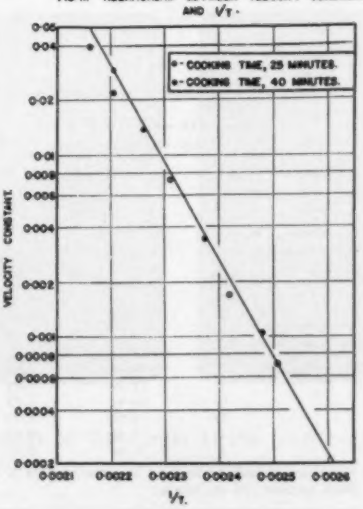
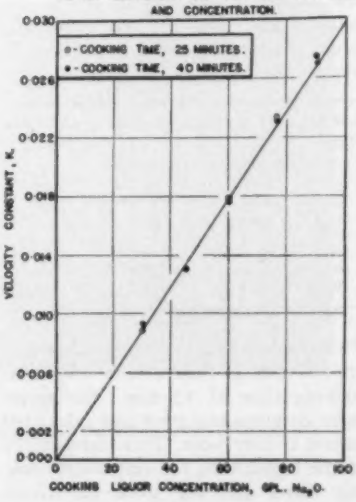


FIG. 12. RELATIONSHIP BETWEEN VELOCITY CONSTANT AND CONCENTRATION.



centration of the cooking liquor. The velocity constants for the various concentrations were calculated by substitution in Equation 11 as follows.

Liquor Concentration (gm. Na_2O)	Cooking Time, θ (min.)	$\frac{1}{\theta}$	L	$\frac{97}{L-3}$	Velocity Constant (K)
30	25	0.040	61.0	1.67	0.0089
45	25	0.040	48.7	2.12	0.0131
60	25	0.040	37.5	2.81	0.0179
76.5	25	0.040	28.1	3.86	0.0234
90	25	0.040	23.5	4.72	0.0270
30	40	0.025	44.2	2.35	0.0093
45	40	0.025	32.0	3.34	0.0131
60	40	0.025	22.0	5.10	0.0177
76.5	40	0.025	14.1	8.73	0.0235
90	40	0.025	10.8	12.43	0.0274

A plot of these calculated velocity constants against the corresponding cooking liquor concentration is shown in Fig. 12 to be a straight line. The equation for this straight line is:

$$K = 0.000297\ C \qquad (IV)$$

Rate of delignification as a function of the combined cooking variables

By proper combination of Equations I, III and IV, the over-all equation for delignification becomes:

$$\text{Log } (L-3) = -(1 \times 10^{10})\ (10)^{\frac{-7870}{T}}\ \left(\frac{C}{76.5}\right) + \log 97 \qquad (V)$$

Equation V is applicable to all of the data presented in Table I for chips of 0.120 in. thickness. The maximum difference between the calculated and experimental values is less than 3.5 per cent. This equation, derived from the data for 0.120 thickness, was applied to the data for chips of 0.280 thickness. Cooking of the 0.280 in. thick chips was done at 180° C. and at a concentration of 76.5 gm. Na_2O per liter (Table I). The observed values for lignin remaining (L) and the corresponding values calculated from equation V are as follows.

Cooking Time (min.)	% of original lignin in Chips (L) Experimental	Calculated	Difference Exp.-calc.
15	99.5	43.7	55.8
25	38.0	25.9	12.1
30	26.1	20.1	6.0
40	17.6	12.6	5.0
50	13.0	8.5	4.5
60	10.1	6.0	4.1
70	7.8	4.7	3.1

Two characteristics of these variations are interesting. First, at the very short cooking time of 15 min., the agreement between observed and calculated values is very poor. This unreliability of the lignin data for very short cooking times and the need for closer study of delignification in the early stages of cooking were pointed out earlier. Second, as cooking times increase, the observed and calculated values became quite close. Beyond 30-min. cooking time, lignin values can be calculated for 0.280 in. chips, using the equation derived for 0.120 chips, with about the same degree of accuracy as when using the data for which the equation was derived. It seems probable that, as the delignification reaction proceeds inward from the chip surface, a point is reached at which the ratio of surface to weight of wood becomes comparable to the ratio for the thinner chips. If such is the case, the delignification equation should contain another variable involving surface. When a series of experiments is conducted using chips of only one size group, this variable is not apparent and becomes part of the reaction constant. In much the same manner, if all cooks were carried out at constant temperature, there would be no need for a relationship between reaction constant and temperature.

Correlation of the delignification equation with other data

Not many sources of data in which concentration and temperature are held constant are available in the literature. The suitability of equation V for the calculation of lignin removal for the experimental data of Nolan (29) (22) was investigated. In these cooking experiments, spruce sawdust was used as a raw material, and the cooking liquor was made up entirely of NaOH, with no sulfide. The observed and calculated values are shown as follows.

Cooking Time (min.)	Cooking Temp. (°C.)	Liquor Conc. (gm. Na_2O per l.)	% Lignin in Chips (L) Experimental	Calculated	Difference Exp.-Calc.
30	140	62	74.0	89.0	−15.0
120	140	31	67.7	80.6	−12.9
30	160	31	64.5	80.5	−16.0
120	160	31	33.1	42.9	− 9.8
60	180	35	11.0	22.9	−11.9
480	100	373	80.2	93.5	−13.3

It will be noted that equation V calls for less lignin removal, in all cases, than was found experimentally. The range of differences, 10 — 15 per cent, might be considered in the order of a constant deviation when one considers the great dissimilarity in the experimental conditions involved. This deviation might be explained by the much larger surface involved in the wood sawdust used by Nolan, when compared to the wood chips used in the present work. This is in line with the reasoning used earlier to account for the differences between observed and calculated results for chips of 0.280 in. thickness.

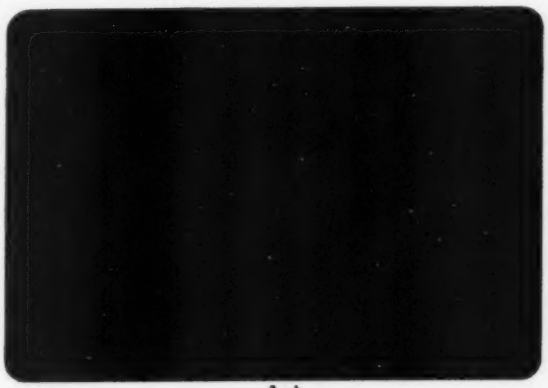
Table II—Analyses of Wood Block Cross-sections

(Block size — 2 X 2 X 2 in.; Temperature — 190° C; Cooking Time — 60 min.; Liquor Conc. — 90 am Na_2O per L; Sulfidity 25%.)

Condition of Block	Section*	Gm. Na_2O per 100 gm. of section NaOH	Na_2S	Total Alkali	Active Alkali	Organic Alkali	% Lignin in Section
Not Pre-evacuated	A	9.79	1.62	18.05	11.41	6.64	7.5
	B	3.27	0.69	8.80	3.96	4.84	18.8
	C	2.84	0.71	8.05	3.55	4.50	23.6
	D	2.06	0.70	6.99	2.76	4.23	24.0
	E	1.12	0.61	5.49	1.74	3.75	23.3
	F	1.17	0.50	5.40	1.67	3.73	23.7
Pre-evacuated	A	19.01	2.05	35.40	21.06	14.34	5.7
	B	12.59	1.43	24.50	14.02	10.48	14.6
	C	10.42	1.35	14.10	11.77	2.33	19.0
	D	8.50	1.20	11.60	9.70	1.90	18.8
	E	7.49	0.83	9.80	8.32	1.48	21.4
	F	8.09	0.43	10.00	8.52	1.48	22.0

*Sections designated as A to F, from outside of block to center. Each section 1/6 in. thick.

Figure 13. Photomicrographs of Sections taken from Cooked Wood Blocks. Wood not pre-evacuated before cooking.
(All slides stained with 1% phloroglucinal solution)



1-A

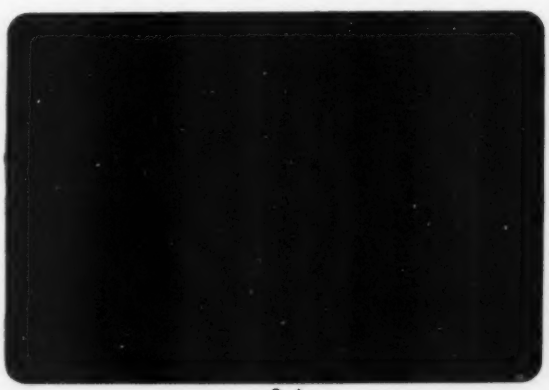
1-B

Sections taken from two cooked blocks at a distance of 0.0985 in. (2.5 mm.) from the exposed surface. Magnification 150 X

2-A

2-B

Sections taken from two cooked blocks at the boundary between sections A and B (Figure 7), 0.167 in. (4.23 mm.) from the exposed surface of the block. Magnification 150 X



3-A

3-B

Sections taken from two cooked blocks at the center of the block, corresponding to Section F (Figure 7). Magnification 430 X

The equation was used for correlation with the experimental results for another series of experiments carried out at constant temperature and concentration (30). In this work, shredded pine chips were used. These chips had been softened by steaming before shredding, resulting in porous, broomed-out chip sections. The cooking liquors used had a sulfidity of 25 per cent. A comparison of calculated and experimental results follow.

Cooking Time	Steam Pressure	Liquor Conc.	% Lignin in Chips (L)		Difference
(min.)	(psig)	(gm. Na_2O per L)	Experimental	Calculated	Exp.-Calc.
10	130	80	26.7	56.2	−29.5
15	130	35	33.6	67.6	−34.0
15	130	50	38.0	68.5	−30.5
20	130	20	39.0	74.3	−35.3
10	148	80	19.4	44.6	−25.2
10	148	35	37.0	69.7	−32.7
20	148	50	6.9	36.3	−29.4
20	150	20	27.9	61.4	−33.5
10	170	35	25.5	63.5	−38.0
12	170	50	10.8	46.6	−35.8

Here, also, the lignin removal calculated by the use of equation V calls for less lignin removal than was actually obtained. The differences, in this case, ranged very closely to 30 — 35 per cent. This range of differences leads one to suspect another constant divergence between experimental and calculated results. The divergence is greater than was found for the delignification of sawdust. However, in the case of shredded wood, liquors of 25 per cent sulfidity were used, while the sawdust was pulped with NaOH alone. Sulfide is known to promote delignification, which may account for the increased speed of delignification.

Part II
The Pulping of Large Cubical Blocks

This phase of the investigation was undertaken in order to follow the progress of the pulping reaction through the chip. To accomplish this, it was necessary to exaggerate the size of the chip so that all degrees of pulping, from complete delignification to completely unreacted wood, would be present in the same specimen. Therefore, 2 in. cubes were used instead of thin chips.

By using such large wood sections, it is possible to follow the progress of the reaction through the block by determining the lignin content of thin sections from the outside to the center of the partially cooked block. In a similar manner, by extraction of the sections and titration of the extract, the penetration inward of active alkali and diffusion outward of reaction products can be followed. The results of these analyses are listed in Table II and are shown graphically in Figs. 6 — 8.

From Figs. 6 and 7, it is apparent that most of the reaction must have occurred within 0.167 in. of the surface of the block which had not been pre-evacuated before cooking. The weight of NaOH and Na_2S per 100 gm. wood is more than double, in this first thin section, the value found in any of the sections farther toward the center.

The quantity of active alkali present in the innermost sections of the block is largely due to diffusion through the edges of the section parallel to the plane of the section. No precautions were taken to prevent diffusion and reaction in these two directions. An estimate of the quantity of liquor in each section which diffused from the edges of the section can be obtained from the amount of alkali present in the innermost section. It is highly improbable that any alkali at the center diffused through all of the six sections. Undoubtedly, all of this alkali was present in the center section from edgewise diffusion.

When this edgewise diffusion is taken into account, the increase in diffusion of active alkali caused by pre-evacuation is not as remarkable as the gradients appear to indicate. The central or "F" section of Table II shows that about 8.5 gm. of the total 21 gm. of active alkali in the outside section of the pre-evacuated block is due to edgewise diffusion. The net diffusion of Na_2O from the outside toward the center is therefore about 12.5 gm. This corresponds to a similar diffusion of approximately 11.4 — 1.7 or 9.7 gm. in the case of the block which had not been pre-evacuated. Therefore, pre-evacuation caused an increase of only

$$\frac{12.5 - 9.7}{9.7} \times 100$$

or 26 per cent in the amount of alkali which penetrated into the outermost section (0.167 in. thick), from one direction only.

In the second section, B, in the case of pre-evacuation, 14.0 — 8.5 or 5.5 gm. of active alkali penetrated through section A into section B. Without pre-evacuation, this penetration into the B section amounted to 3.9 — 1.7 or 2.2 gm.

These alkali gradients plotted in Figs. 6 and 7 show definitely that alkali does not penetrate very rapidly ahead of the delignification reaction. The cooking time employed before the sections were taken was 60 min. at a temperature of 190° C. and a concentration of 90 gm. Na_2O per liter. These cooking conditions are quite drastic but, even after a full hour of cooking, the amount of active alkali which had penetrated more than 0.167 in. was relatively small. While there were 9.7 gm. Na_2O per 100 gm. of wood in the outermost section, there were only 2.2 gm. which had passed this outer depth of wood into the next section (without pre-evacuation).

The liquor gradients shown in Figs. 6 and 7 become more significant when the lignin gradients shown in Fig. 8 are considered at the same time. Let us first consider the lignin gradient for the block which was not pre-evacuated before cooking. The average lignin content in the outer section A is only 7.5 per cent. The section adjacent to it, section B, had a lignin content of 18.8 per cent. From this point to the center of the block, sections C, D, E, and F, the lignin content of the sections was practically constant at an average of 23.3 per cent. The difference between 28 per cent, the lignin content of the uncooked wood, and 23.3 per cent can be considered as lignin which was removed by attack from the four edges of the sections.

The very rapid change in lignin content from section A to section B indicates that most of the delignification has occurred in section A. This is in very close agreement with the alkali gradient curves in Figs. 6 and 7, which show that very little alkali has penetrated beyond section A.

A study of the photomicrographs in Fig. 13 bears out the evidence of the alkali and lignin gradient curves. Photographs 1-A and 1-B show that, for a distance of 0.0985 in. from the exposed surface, lignin has been completely removed. The blue color indicates complete removal of lignin. Photographs 2-A and 2-B, taken at the boundary between sections A and B (0.167 in. from the exposed surface), show that some delignification

may have taken place. The blue streaks indicate that the reaction interface may not move in a smooth front but may consist of an irregular section, caused by differences in wood density or other physical differences in wood structure.

It is admitted that the brown color present in the photographs is not quantitatively indicative of the amount of lignin present in the sections. However, the blue stain in Fig. 1-A and 1-B shows definitely that delignification is practically complete at that point. This being the case, the lignin gradient in Fig. 8 can be redrawn.

In Fig. 8, analysis of section A showed that the whole section contained an average of 7.5 per cent lignin. The total area under this section of the curve is 7.5 × 0.167 or 1.25. However, photographs 1-A and 1-B in Fig. 13 show that lignin is absent in this section to a depth of 0.0985 in. Since the total area under the curve must be constant at 1.25, the lignin content of that part of the section which has not been completely delignified must be

$$\frac{1.25}{0.167 - 0.0985}$$

or 18.3 per cent lignin. These figures must be considered as qualitative but they show definitely that there must be a very rapid change in lignin content over a very narrow reaction band. The combined evidence of alkali gradient, lignin gradient and the photomicrographs shows definitely that there is an inwardly moving reaction interface. The evidence also shows that penetration is only slightly, if at all, ahead of this reaction interface.

Returning to the case of the blocks which were cooked after pre-evacuation, it seems doubtful that evacuation before cooking has any great effect on the speed of delignification. It was shown above that the magnitude of alkali penetration in the outer section A, of the block was about 25 per cent greater, for the pre-evacuated block. In the case of section B, this increase in alkali penetration was 50 per cent. However, this increased alkali penetration due to pre-evacuation is not reflected in the magnitude of delignification.

Comparison of the lignin gradient curves, Fig. 8, shows that evacuation before cooking does not greatly affect delignification. The flat part of the delignification gradient indicates that, in case of blocks which had not been pre-evacuated, 28.0 − 23.3 or 4.7 per cent lignin is removed by edgewise reaction. Therefore, the delignification of section A caused by reaction on the outer face of the section is 28 − (7.5 + 4.7) or 15.8 per cent. In the case of pre-evacuated blocks, the edgewise reaction appears to remove 28.0 − 21.7 or 6.3 per cent lignin. Delignification by reaction on the outer face of section A is, consequently, 28.0 − (5.7 + 6.3) or 16 per cent. The figures indicate that delignification in section A is about the same in both cases.

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Starch Cooker

(Continued from page 139)

a sensitivity of pressure regulators and flow controls far beyond the normal tolerance of such devices.

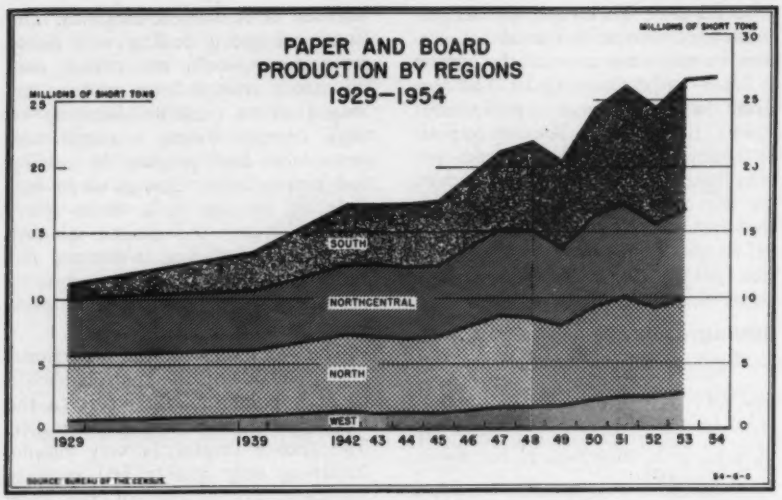
The cooking system is illustrated in Fig. 1, 2, and 3. The system includes four functional groups which are separable divisions that may be installed in convenient locations. The functional group dealing with slurry preparation should be located near the starch storage room and so arranged as to facilitate dumping of bags. In this system, a single tank serves the dual purpose of mixing and supply tanks. This is made possible by the use of a water meter which measures the desired quantity of water as each bag is dumped and a discharge strainer so located as to be unaffected by the starch in process of mixing.

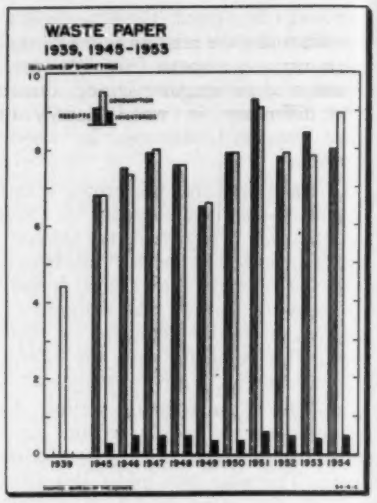
The location of the functional group embodying the controls should be at a point of easy access to the machine tender or the paper-maker. The cooker control is very simple, involving only quality and quantity variables. The quality of the paste is determined by setting the automatic temperature regulator and quantity is measured by a rotameter set to the desired starch weight per hour. Precision pressure regulation maintains consistency of flow.

The functional group dealing with water regulation includes an arrangement of automatic pressure valve and orifice which maintains constant flow to the cooker unit. If there is no starch flow from the control unit, the cooker will receive only water. As the flow of starch increases, the flow of diluting water decreases correspondingly so that the system delivers a constant volume with variable concentration of starch solids.

The cooker group should be located at the point selected for the introduction of the starch paste into the paper machine system, since the discharge line from the cooker to the point of paste cooling should be limited to a few feet in length.

The jet cooker is housed in the body casting of a conventional globe valve. In appearance it is, therefore, no more than a pipe-line fitting joining starch inlet, steam inlet, and paste discharge. Internally, the steam flow is directed to a cone-shaped expanding jet in the space separating parts A and B, Fig. 3. The starch flow entering at the right side is formed into a cylindrical film between parts B and C. In the space between parts C and A, the violent action which characterizes the jet heat transfer is completed. The spacing between A and B is regulated by a screw E which is rotated by a motor through friction clutch F. This in turn controls the thickness of the steam jet and the rate of steam flow. Thus, the jet cooker serves also as its own steam flow regulating valve. D is a guide plug for positioning cap B in concentric alignment with parts A and C.





Changing paper-making fibers and the outlook for their use*

D. C. EVEREST

Chairman of the Board
Marathon Corp.

WITH THE CHANGES in the species of wood used, the utilization of waste from logging operations, the work which is being done on annual plant growths and the added difficulties we experience in the re-use of paper stock due to additives or coatings put in or on some papers and paperboards to meet certain customer requirements, we are all faced with the most complicated economic problem and revision of formulae for the manufacture of paper and paperboard.

Probably the most upsetting of these is in the increased use of the hardwood species of trees in the manufacture of pulp by the neutral sulfite or semichemical methods, with all the modifications of these processes which have been made in many mills. This has added greatly to our usable supply of wood throughout the nation, but it supplants other raw materials and, based on the technical work being done in many laboratories, bids fair to be used in many of the higher grades of paper and paperboard. This process will fast become a source of a new kind of pulp, and the fibrous material on which the greatest competitive reaction comes depends on specific uses and the ultimate cost of manufacture.

The use of bagasse as a source of raw material also poses a potential upset to our generally accepted program of cellulose fiber use. From the samples of paper made from bagasse which I have seen recently, I think the company which is promoting the idea of pulp manufacture from waste sugar cane has accomplished more than anyone who has previously worked with any domestic annual plant growth.

The changes which occur in any annual plant growth from the time it is harvested until a new crop is available has always been the stumbling block in continuously making a pulp of uniform quality. Some means may be found to overcome this, but the storage of the material also becomes quite a problem.

Despite the fact that paper and paperboard production last year was the highest on record, the consumption of waste paper declined by half a million tons, or 5½ per cent. Two factors were primarily responsible for this decline in the use of waste paper:

1. The major outlet for reclaimed waste paper is paperboard, and readjustments in the over-all national economy last year adversely affected the demand for paperboard for packaging.
2. Facilities for the production of captive wood pulp were expanded sharply last year, and the consumption of captive wood pulp enjoyed relative gains at the expense of waste paper and other "purchased" fibers.

The decline in waste paper consumption last year brought the salvage rate to the lowest recorded level since 1909.

Never the less, in spite of this decline, waste paper consumption last year totaled a little over 8 million tons.

In the interest of an orderly fiber economy, it will become increasingly important to view waste paper in proper perspective; to measure more precisely its true potentialities, and to attack the technical and economic

*Condensed from a paper presented at the meeting of the Waste Paper Institute, Chicago, March 21.

problems incident to its utilization with the same intelligence, vigor, and diligence with which the problem of wood utilization is being approached.

Relative consumption of "purchased" fiber and captive wood pulp

Twenty years ago, almost two-thirds of the fiber consumed by the domestic paper and paperboard industry was "purchased" fiber of one type or another; only about one-third was captive wood pulp.

Further, at that time, 60 per cent of this country's market chemical wood pulp requirement came from overseas supply sources. The flow from overseas was variable, and prices, as a consequence, were extremely volatile. The markets for other types of purchased fiber took their cue from imported wood pulp, and volatility, as a result, was the predominant characteristic of the whole fiber economy. The volatility was contagious; because of its heavy relative dependence upon purchased fiber, the entire pulp and paper industry was usually infected. The lack of statistical data showing current supply and demand trends in world wood pulp markets increased the uncertainties and made it difficult to treat the infection.

During the past 20 years, however, and particularly during the postwar period, there has been a very sharp increase in integrated facilities in this country. The industry's capacity to consume captive wood pulp, as a result, has increased steadily. There has been no comparable increase in the industry's capacity to consume purchased fiber.

In producing 26.6 million tons of paper and paperboard last year, the domestic industry consumed a total of 28.3 million tons of fiber, all types included.

Of the total tonnage of fiber consumed, 58.7 per cent was captive wood pulp and only 41.3 per cent purchased fiber. As recently as 1946, in contrast, purchased fiber constituted 53.9 per cent of the total furnished, and captive wood pulp only 46.1 per cent.

During this same 20-year period, great progress has also been made in improving the mechanics of collecting, promulgating and using statistical data. Better understanding of the trends and relationships of supply and demand, on a current basis, is enabling the modern businessman to detect infection in its early stages and giving him time to do something about it before it is too late.

We can conclude, therefore, that three factors are at least partly responsible for the fact that the over-all fiber economy is relatively more stable today than it was 20 or even 10 years ago:

1. The decline in relative dependence upon purchased fiber
2. The decline in relative dependence upon overseas' supply sources for virgin wood pulp
3. Improved knowledge of supply and demand trends and relationships in the market place.

Pattern of consumption of "purchased" fiber

The "purchased" fibers upon which the paper and paperboard industry relies may be divided into three categories:

1. Market wood pulp
2. Waste paper, consisting in the main of regenerated wood fiber
3. Rags, straw, and other fiber.

Of the total consumption of purchased fiber last year, 68.9 per cent was waste paper, 20.7 per cent market wood pulp, and 10.4 per cent rags, straw, and other fiber.

It is to waste paper and market wood pulp that the industry currently looks for almost 90 per cent of its total requirements of purchased fiber. In the relative usage of each of these, there has been no consistent trend or pattern during the postwar period. The relative use of each appears to have been influenced primarily by three factors:

1. The relative availability of each type of fiber
2. The relative cost of each
3. Cyclical trends in those products in which each type of fiber finds its major outlet.

Last year, these factors operated very slightly in favor of market wood pulp. As contrasted with the 5½ per cent decline in the level of consumption of waste paper, market wood pulp consumption by the paper and board industry declined 3.1 per cent.

The salvage rate

The growth of the pulp and paper economy in recent years has been a result, primarily, of phenomenal market development in three major end-product fields: (1) sanitary paper products: (2) building materials, and (3) packaging.

The bulk of the production of sanitary paper products is disposable. This means that most of the fiber used in the manufacture of these products is not reclaimable. The spectacular increase in the rate of production of sanitary paper, therefore, does not suggest a corresponding rate of growth in the supply of waste paper available for salvage.

The production of paper and paperboard for use in the building industry has grown at a faster rate than any other single use classification. Both the nature of this use and the type of fiber predominantly used for this type of product tend to make it impracticable to reclaim any significant proportion of this tonnage for re-use as fiber. Thus, the growing importance of building paper and boards in our over-all economy will problably contribute little to our basic over-all supply of reclaimable fiber.

Tonnage-wise, although not percentage-wise, the growth in the use of paper and paperboard for packaging in recent years has outpaced all other end-uses. A tremendous volume of our strongest and best fiber is consumed in the manufacture of products for the packaging industries. Yet it is in this area primarily that the problem of contamination has reared its ugly head. To what extent contamination, long range, will tend to destroy valuable fiber that would otherwise be recoverable remains to be seen. The economic values that hinge upon the solution of this major technical problem are great.

The point of all this is that the pattern of paper and paper-board supply has changed significantly in recent years and will continue to change in the years to come. These changes in the basic pattern of primary paper and board supply significantly affect the opportunities for salvage. Application of a hypothetical salvage rate to forward estimates of over-all paper and paperboard supply is no longer adequate to provide basic information for forward planning in the waste paper economy. Careful study is needed of each of the major segments of the primary pulp and paper industry, and separate appraisals of the opportunities for salvage that each of these major segments presents. The industry needs this information not only to determine the total volume of used fiber that it is practicable to reclaim, but also to permit it to determine, by type, the pattern of the used fiber supply that it is going to be feasible to reclaim.

With this type of information, individual producers will be in a position to explore intelligently the opportunities for an efficient utilization of the types of waste that will be available to create markets for new products that will use these specific wastes and to install new productive facilities based upon an assured and steady supply of reclaimed fiber of known quality.

Without knowledge of the scope and pattern of the potential supply of waste paper, supply/demand relationships in the waste paper economy will continue to be the hit or miss type of arrangement.

Fig. 1—Control panel for two sulfite digesters includes level recorders, temperature and pressure program controllers, and multiple-point temperature recorders

New automatic system yields more pulp — at Racquette River mill

INCREASES IN PULP YIELD and improved quality, stretching uniformly from batch-to-batch, were the results experienced by a New York state mill after the addition of an automatically controlled Chemipulp system.

Engineers at Racquette River Paper Co. at Potsdam, N.Y., report an increase in yield of some 20 per cent, plus a 20 per cent decrease in cooking time, thanks to the new system. Uniform quality was maintained despite periodic changes from spruce to hemlock and back again. Racquette River manufactures specialty papers and lap pulp.

Prior to the installation of the new automatic system, quality was rated at: Initial Mullen — 0.74, and tear — 1.20. With the new system these figures jumped to: Initial Mullen — 0.97, and tear — 1.50. That was with cooking spruce. With a batch of green hemlock Initial Mullen of 0.80 and a tear of 1.44 was obtained. On one order, using green hemlock, the new system made it possible to ship to the customer just seven days after the trees were felled in the woods.

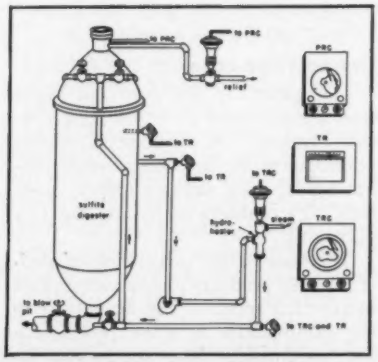


Fig. 2—Integral cam programmers control temperature and pressure of sulfite digester employing Chemipulp hot acid process

Racquette River engineers attribute the benefits achieved with the new system to two things. First, continuous circulation of hot acid through the digester distributes the heat throughout the charge more evenly. This, in turn, makes the temperature of the acid leaving the digester representative of the entire digester charge.

Second, this temperature is closely and automatically controlled over a carefully calculated time-temperature schedule.

Cam-type instruments used

The engineers explain that the two instruments responsible for automatically controlling conditions within the digester are integral cam programmers. Each incorporates a plastic motor-driven cam cut to conform to the desired time-pressure or time-temperature cycle. As each cam rotates, a fol-

lower, bearing upon its periphery, mechanically repositions the instrument's set point index. The control unit in the instrument then continuously repositions the steam or relief valve to produce the desired time-temperature or time-pressure relationship within the digester.

The time-temperature controller is an integral cam electronic instrument actuated by a thermocouple. This is inserted in the hot acid line downstream from the hydroheater which injects steam into the circulating acid. Controlled air from this instrument positions the hydroheater steam supply valve. This, in turn, regulates the temperature of the acid and, consequently, that of the digester charge.

A time-pressure controller, also of the integral cam type, measures digester pressure and operates the relief valve.

By means of these two cam program controllers, the digester can be brought to the desired conditions on an exact time schedule—something generally conceded to be impossible with manual control.

An electronic strip chart recorder (see Fig. 1), which is mounted below the time-temperature controller on each of the two digester control panels, continuously plots values of the temperatures of the acid leaving the digester, the temperature of the acid leaving the hydroheater, and that of the digester charge itself.

This chart record provides the digester cook with a picture of conditions within the digester. He can then compare them with acid temperatures in other parts of the circulating system.

A variety of other industrial control instruments are also incorporated in the pulp mill operation. Recorders, for example, chart the digester level and the loads on circulating pump drive motors.

In the acid plant a controller regulates the liquid level of the sulfur in the sulfur burner. It facilitates production of gas having between 18 and 18.4 per cent SO_2. Sulfur level is measured by bubbling air through the molten sulfur in the burner and measuring the air pressure required to force the bubbles from the dip tube. The instrument automatically controls the level by regulating the amount of molten sulfur fed to the burner.

Other instruments are also used on the accumulator, where the digester relief gases bubble through the cooking acid, strengthening it and heating it in preparation for use in the next charge. Accumulator pressure is automatically controlled, while temperature and level are recorded.

Polyethylene films extend the use of paper in packaging

POLYETHYLENE-COATED PAPERS of various types are now being produced by Crown Zellerbach Corp. Among these new plasticized papers are multiwall bags and an improved frozen food wrap sold under the trade name of "Loc-Zin". A wide range of samples representative of the hundreds of other uses of the plastic-coated paper has been manufactured and is now being shown by the company's or its distributors' sales organizations.

"This 'wedding' of plastic and kraft paper, which culminates a decade of research by the C-Z experimental laboratory at Camas, Wash., and field trials, marks the opening of virtually unlimited new uses for paper and offers new quality features of great importance to our customers," says Crown Zellerbach Vice President G. J. Ticoulat.

Polyethylene-coated papers are essentially a film of polyethylene bonded to one or both sides of a sheet of paper, any type from tissue to heavy board. The film can also be sandwich-laminated between two sheets. According to Mr. Ticoulat "Polyethylene paper is impervious to water, remains tough and flexible even at very low temperatures and provides a vapor barrier under all conditions of use."

Potential uses and applications

The packaging uses for this new blend of pulp and plastic seem to be endless. The polyethylene-coated material is an excellent barrier to most liquids. It can be used to package syrup, sauces, pickles, and bait. Nurserymen are discovering that polyethylene-coated paper eliminates water evaporation in the shipment of plants, thereby enabling the shipper to economize on wrapping material, peat moss and water in packaging. In a trial run, one small nursery operator saved $7,000 on postal and express charges alone because of greatly reduced weight.

Low moisture transmission also suits this coated paper ideally for packaging dried milk, dried soup, tobacco, cosmetics, silver polish, sugar, cement. It can be used to protect tools and metal parts against rust. And because it is impervious to fats and oils, the polyethylene laminate can be used to package many salves, greases, even motor oil, lard and butter. And, what is so important in food packaging, the new paper is odorless and tasteless.

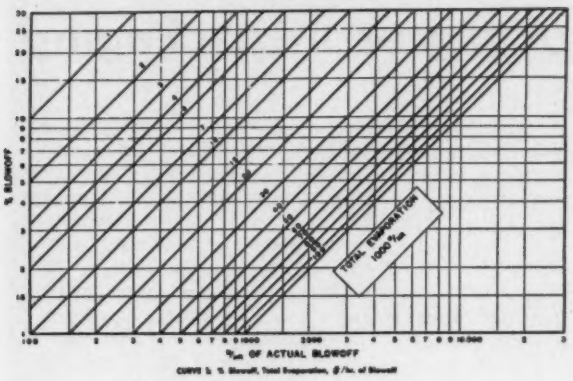
Of particular interest to those facing a chemical reaction problem in their packaging is the fact that the polyethylene-coated paper resists most acids and alkalis, as well as brine and solvents. It withstands hydrofluoric acid, which will etch or eat through a glass container.

The new Crown laminated paper retains its flexibility at temperatures as low as −75° F, yet is very tough and durable, even to 200° F. Its polyethylene film, being an inert, uncompounded plastic, assures long package life. Polyethylene, too, has the lowest specific gravity of any commercial plastic, thus it gives paper coated with it a special lightness, besides providing extra insulating thickness and delivering more wrapping area per pound.

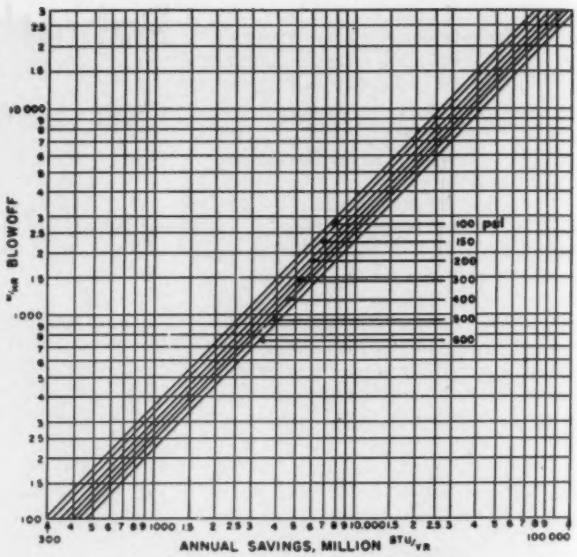
Frozen foods do not stick to the polyethylene surface. It makes a first-rate backing for pressure-sensitive tapes, as well as camelback for rubber goods. TV sets and other fine furniture can be wrapped in this coated paper without harm to the finish. And its snowy, enamel-like appearance enhances the eye appeal of contents. It is crease resistant and even at sub-zero temperatures it neither cracks nor flakes.

Sealing is simplified also. The new material seals well under heat; its bond is, in fact, as strong as the laminated paper itself, and trapped powder particles will not weaken this seal.

Other uses forecast for polyethylene-coated papers include construction paper for use as a moisture barrier for inside walls and underlay for subfloors, protective sheeting for hospital and dental use, for machinery parts packaging where flexibility and grease proofness are important. It is also useful for tarpaulins to cover machinery, cotton bales, for soils, outdoor furniture, wood and coal piles, and as case liners for meats, poultry, machinery, and in corrugated and fiberboard boxes where a release coating or a moisture barrier or chemical resistance is needed.



CURVE 1: % Blowoff, Total Evaporation, #/hr. of Blowoff



CURVE 2: #/hr. of Blowoff, Boiler Pressure, Annual Savings

BTU savings from continuous blowoff heat recovery

V. J. CALISE
Research and Development Director
Graver Water Conditioning Co.

EVERY BOILER PLANT must take precautions to recover waste heat to reduce operating costs. The practice of blowing off even very small and low-pressure boilers — as well as large, high-pressure plants — intermittently and by hand is intolerable in these days of high fuel and labor costs.

In most cases, continuous blowoff heat recovery equipment, as installed, pays for itself in fuel savings in less than three years, and, in some cases, in less than two years.

For any given boiler plant you can calculate in seconds the annual savings in millions of BTU per year resulting from the recovery of heat from boiler blowoff by means of a continuous blowoff system. Merely use this simple, four-step procedure as applied to the accompanying table and curves:

1. Determine the total dissolved solids in the makeup in ppm and chose the allowable concentration in the boiler in ppm from the following chart based on ABAI standards:

Boiler Pressure, psig	Total Dissolved Solids, ppm
0- 300	3500
301- 450	3000
451- 600	2500
601- 750	2000
751- 900	1500
901-1000	1250
1001-1500	1000

Suggested limits sometimes recommended by experts for maximum permissible silica concentration in boiler water for various pressures are:

Boiler and Turbine Operating Pressure, psig	Maximum Silica in Salines ppm as SiO_2
250- 600	40-50
601- 900	20-30
901-1200	10-20
more than 1200	less than 5-10 and less than 1 above 1800 PSIG

For high-pressure boilers, particularly where turbines are used with condensers for very low-pressure steam discharge, the maximum permissible silica concentration in the boiler water is usually set by the power engineer or consultant so that there will be no danger of turbine blade silica deposits.

These values are subject to change based on operating experiences in the field and new experimental data.

2. From Table 1, find the per cent blowoff of the total evaporation. This table is based on 100 per cent makeup. If the makeup is less than 100 per cent, use this formula to calculate the blowoff in pounds per hour:

$$\text{Blowoff} = \frac{\text{(Makeup Solids)}}{\text{(Max. allowable boiler TDS)} - \text{(Makeup Solids)}} \times \text{(Makeup for Evaporation)}$$

Example:
Boiler pressure = 475 psi
Total evaporation = 100,000 lbs. per hr.
Makeup solids = 250 ppm
Blowoff solids = Maximum allowable (2500 ppm, according to ABAI)
Condensate returns = 50% of total evaporation, or 50,000 lbs, per hr.

TABLE 1
TOTAL DISSOLVED SOLIDS — ALLOWABLE CONCENTRATIONS — % BLOWOFF
Based on 100% Makeup

TOTAL DISSOLVED SOLIDS MAKEUP PPM	% BLOWOFF OF TOTAL EVAPORATION — ALLOWABLE CONCENTRATION, PPM						
	1000	1250	1500	2000	2500	3000	3500
10	1.0	0.8	0.7	0.5			
15	1.5	1.2	1.0	0.8	0.6	0.5	
20	2.0	1.6	1.4	1.0	0.8	0.7	0.6
25	2.6	2.0	1.7	1.3	1.0	0.8	0.7
30	3.1	2.5	2.0	1.5	1.2	1.0	0.9
40	4.2	3.2	2.6	2.0	1.6	1.3	1.1
50	5.3	4.2	3.4	2.6	2.0	1.7	1.4
60	6.4	5.0	4.2	3.1	2.5	2.0	1.7
70	7.5	5.9	4.9	3.6	2.9	2.4	2.0
80	8.7	6.8	5.6	4.2	3.3	2.7	2.3
90	9.9	7.8	6.4	4.7	3.7	3.1	2.6
100	11.1	8.7	7.2	5.3	4.2	3.4	2.9
125	14.3	11.1	9.1	6.7	5.3	4.3	3.7
150	17.7	13.6	11.1	8.0	6.4	5.3	4.5
200	25.0	18.8	15.4	11.1	8.7	7.2	6.1
250		25.0	20.0	14.3	11.1	9.1	7.7
300			25.0	17.6	13.6	11.1	9.4
400				25.0	19.0	15.4	12.9
500					25.0	20.0	16.7
600						25.0	20.6
700							25.0

Makeup for evaporation = 50,000 lbs. per hr.

$$\text{Blow off} = \frac{250 \times 50{,}000 \text{ lbs. per hr.}}{2500 - 250} = 5500 \text{ lbs. per hr.}$$

Total makeup = Makeup for evaporation + blowoff
= 55,550 lbs. per hr.

Feedwater = Condensate returns + total makeup
= 105,550 lbs. per hr.

For determining the blowoff based on maintaining a given silica concentration in the boiler salines with a given silica concentration in the treated makeup, use this formula:

$$\text{Blowoff} = \frac{\text{(Makeup Silica)}}{\text{(Max. allowable silica)} - \text{(Makeup Silica)}} \times \text{(Makeup for Evaporation)}$$

3. Using Curve 1 and knowing the total evaporation, determine the actual pounds per hour of blowoff.

4. Using Curve 2 and knowing the boiler pressure, determine the approximate annual savings in millions of BTU per year. The actual dollar savings per year can then be calculated for each plant. This curve is based on 75 per cent boiler efficiency. For other efficiencies, multiply result by proper ratio.

EXAMPLE:

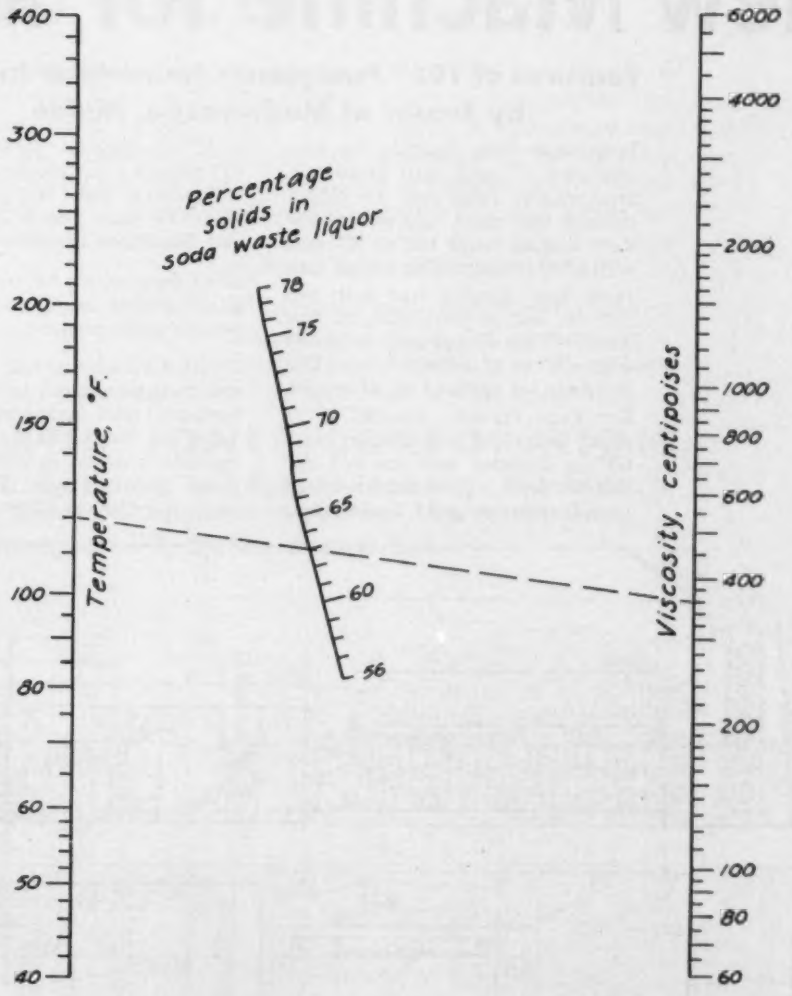
Boiler pressure:	400 psi
Total dissolved solids in makeup water:	90 ppm
Amount of makeup:	100%
Total evaporation:	50,000 lbs./hr.
Allowable concentration:	3,000 ppm
From Table 1, Blowdown =	3.1%
From Curve 1, Blowdown =	1,550 lbs./hr.
From Curve 2, Annual Savings =	5,500 million BTU/year

Nomograph for viscosity of soda waste liquor

D. S. DAVIS
Professor of Chemical Engineering
Virginia Polytechnic Institute

PROPER PROVISION for the flow of soda waste liquor in pipe lines requires reliable estimation of the viscosity of this material over wide ranges of concentration and temperature. Linearity of the logarithm of viscosity in centipoises with the logarithm of temperature in degrees Fahrenheit is the basis for the accompanying line coordinate chart, which extends the utility of the original underlying data (3).

The use of the chart, which was constructed by means of methods (1, 2) described previously, is illustrated as follows: At 120° F., what is the viscosity of soda waste liquor that contains 63 per cent solids? Connect 120 on the temperature scale and 63 on the percentage solids scale with a straight line and note the intersection with the viscosity scale at the desired value, 360 centipoises. At what temperature should one maintain a 70 per cent soda waste liquor so that the viscosity will not exceed 1000 centipoises? Connect 1000 on the viscosity scale and 70 on the percentage solids scale with a straight line (not shown) and project this line to the scale at the left, where the minimum temperature is read as 142° F.



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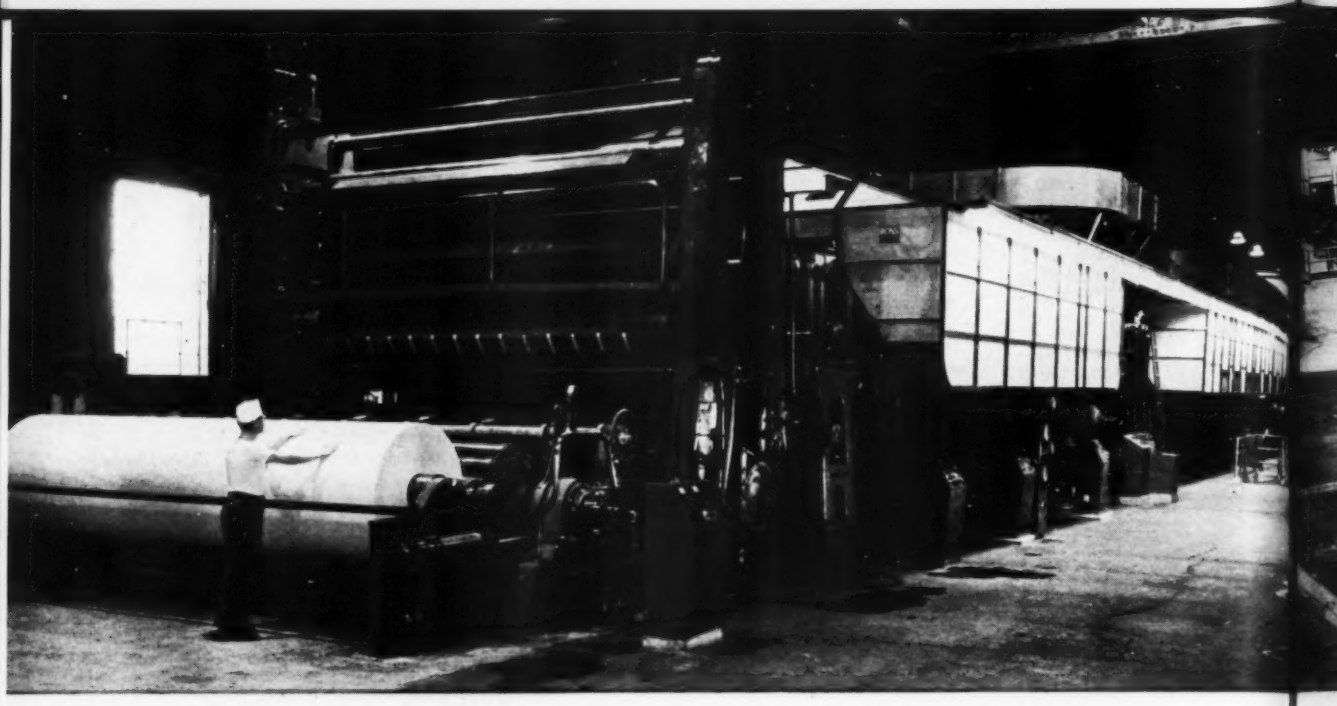


New Machine for an old one

Features of 196" Puseyjones Fourdrinier installed by Fraser at Madawaska, Maine

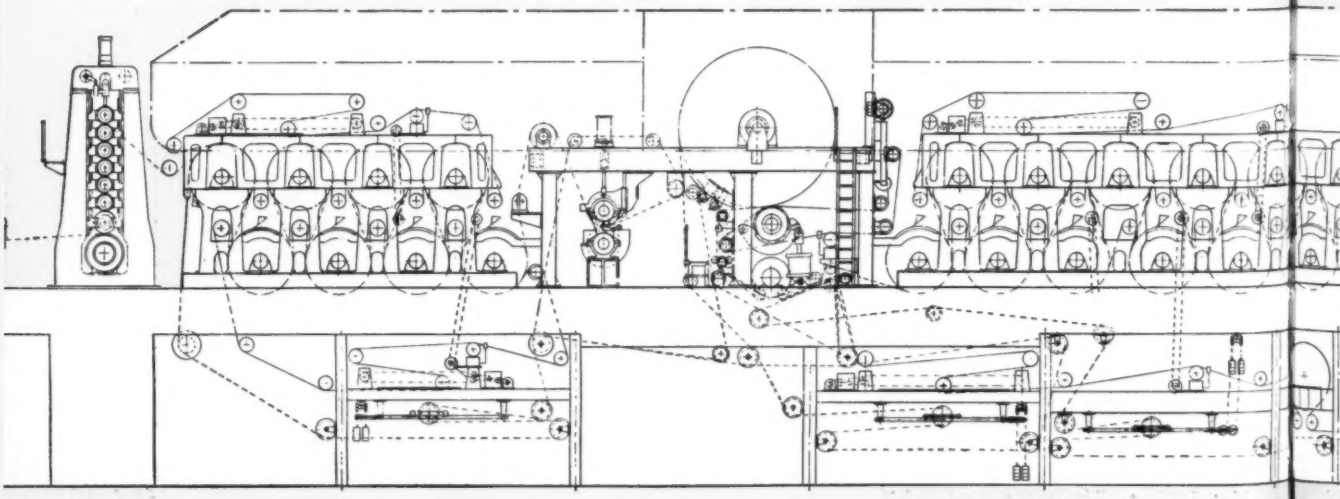
Fourdrinier Part: Suitable for wire 196"x94'-2", with dual breast roll arrangement. Table rolls are rubber covered, wire return rolls are stainless steel. Suction couch roll is 44" dia., with 6" to 10" adjustable suction box.

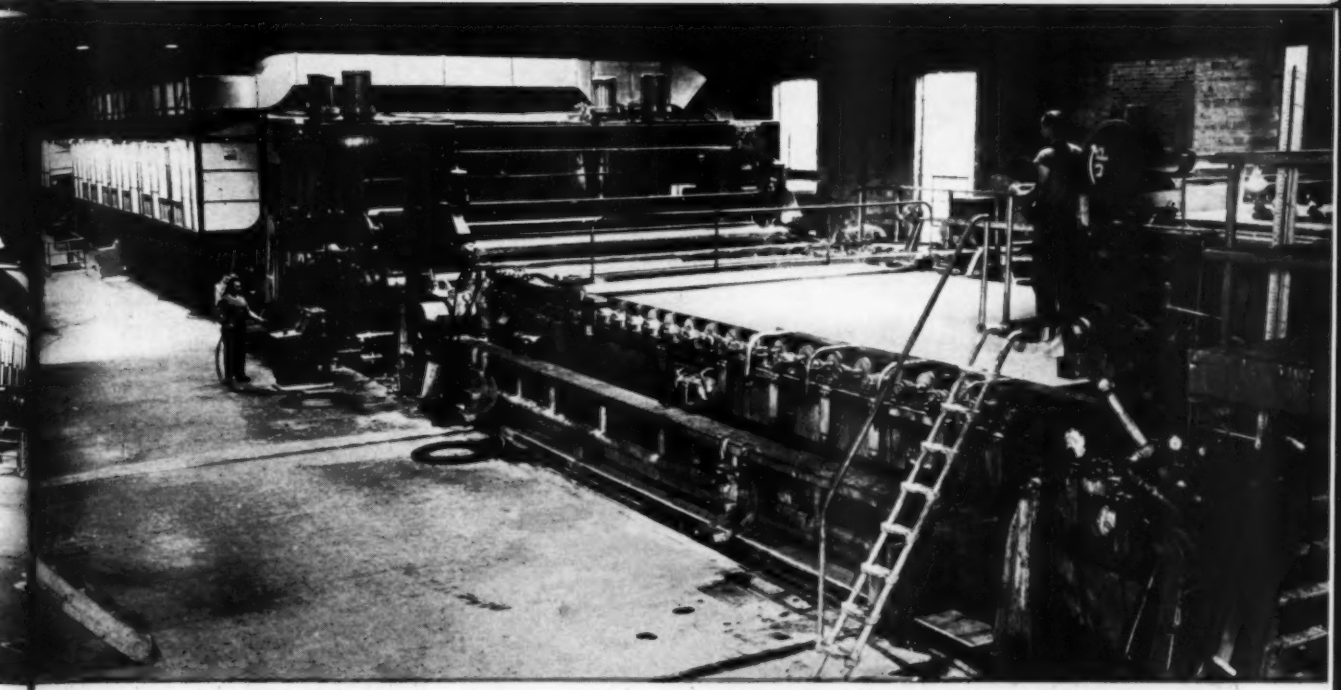
Press Part: Simplex type with two 36" dia. suction press rolls, the first with a 4" suction box and the second with a 4" to 8" adjustable box. Felt stretchers are operated by air motors.

Dry Part: Pre-dryer consists of 23 paper dryers and 8 felt dryers, each 60" in diameter, and one 36" dia. transfer dryer, all constructed for 75 pounds steam pressure. Yankee dryer is 12' in diameter, constructed for 125 pounds steam pressure, with two 32" pressure rolls. Size press is followed by steam-heated 24" set roll and Mt. Hope expander roll.

After-dryer section has eight 60" dia. paper dryers constructed for 125 pounds steam pressure.

8-roll Calender stack with non-deflecting bottom roll and Puseyjones horizontal track Pope-type reel—provided at the finishing end. The machine is driven by a Reliance sectional generator type drive with a range from 500 to 2,000 f.p.m.





e . . . at FRASER

In June, 1954, Fraser Paper, Ltd., dismantled a 26-year-old Puseyjones machine at their Madawaska, Maine, mill. In its place, a new one, designed and constructed to operate up to a speed of 2,000 feet per minute, was installed. Width of the new machine required widening of the foundation.

Puseyjones engineers, working closely with plant management, designed the new 196" wire width machine to increase Fraser's bond paper capacity. It's a dual-purpose machine for the manufacture of M.F. or M.G. papers — with provision for future installation of a vacuum pick-up and transfer arrangement. The Yankee Dryer is 12 feet in diameter, and equipped with Sunday Drive. The rope system for carrying the paper is arranged so that paper can bypass the Yankee Dryer.

When your production problems require modernization of present machines or a completely new machine, put Puseyjones on your team. Call or write us today.

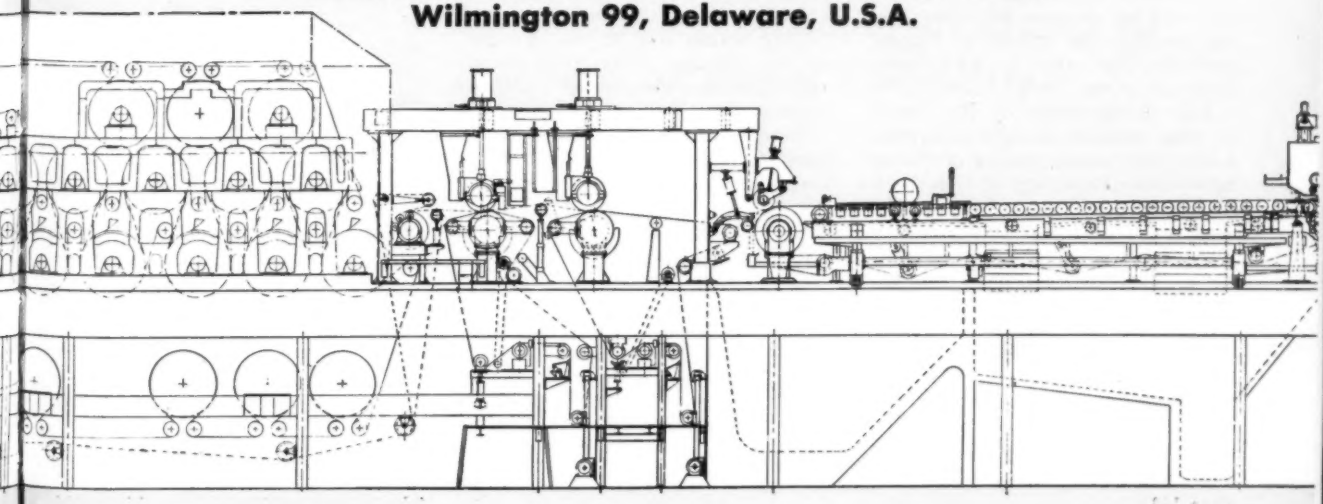
THE SIGN OF TRADE MARK SUPERIOR QUALITY

THE PUSEY AND JONES CORPORATION

Established 1848. Builders of Paper-Making Machinery

Fabricators and Welders of all classes of Steel and Alloy Products

Wilmington 99, Delaware, U.S.A.



NEWS of the INDUSTRY

INTRODUCING A KNOWN quantity of a chemical solution into the girdled area of a tree, Dr. Hugh Wilcox and Robert Smith participate in field research on chemical debarking. The men are staff members of the New York State College of Forestry. They will study the speed with which the chemical is carried up through the sapwood of the tree

Notes on Forestry Activities . . .

Chemical Debarking Research Project Issues Favorable Report at Syracuse

CHEMICAL DEBARKING is a useful tool, not only of practical value in planning and executing logging schedules, but also in silvicultural treatment of the forest.

This announcement by Dr. Edwin C. Jahn officially brought to a close a four-year research project conducted by the State University of New York College of Forestry at Syracuse. Dr. Jahn is the school's associate dean for physical sciences and research.

The $175,000 research program was sponsored by 17 pulp and paper and chemical firms. It was undertaken to learn more about factors influencing chemical debarking, to determine the movement and distribution of the chemical in the tree, and to ascertain its effect on the living tissues. The practicability of applying a toxic chemical to the living tree during the sap-peeling season was proved in work on the college's Huntington Forest and on company-owned lands in New England, New York and Pennsylvania.

Among the sponsors of the project were American Smelting & Refining Co., Eastern Corp., Eastern Pulpwood Co., Fraser Companies Ltd., Glatfelter Pulp Wood Co., Hollingsworth & Whitney Co., International Paper Co., Oxford Paper Co., Penobscot Chemical Fibre Co., St. Lawrence Corp. Ltd., St. Regis Paper Co., West Virginia Pulp & Paper Co., Armstrong Forest Co., Brown Co., Dead River Co., Marathon Corp., and the Pulp & Paper Research Institute of Canada.

DETERMINATION OF resistance to bark-peeling is made by Dr. Wilcox. The debarking project at the Syracuse school was sponsored by 17 pulp and paper and chemical firms

Poplar Comes of Age

Universally scorned as a "weed tree" only a generation ago and regarded with some contempt by the old-time woodsman even today, the poplar is coming of age as a factor in Wisconsin forestry.

Millions of cords of poplar (or aspen) are now being harvested as a result of technological advances in its use in the timber and pulp industries.

Indicative of the rising status of the tree is the full-scale research project being conducted at the University of Wisconsin in Madison. Scientists in the plant pathology department are breeding poplars for disease resistance and other superior characteristics.

The investigators have reported that thus far several selections and hybrids have appeared promising. One has grown to a height of 41 ft. and a diameter of 6 in. in six years.

Striking differences in growth rates, branching, form, and susceptibility to disease, insect and rodent damage have been shown among the 4000 seedlings obtained from controlled crosses.

Revised USFS Contracts

The United States Forest Service on July 1 will begin using a completely revised timber sale contract

form for all but small sales. According to the Department of Agriculture, the new form will be in full use by January 1, 1956.

In drawing up the new form, USFS timber management officers were assisted by representatives of timber associations and forest industries purchasing national forest timber. The inadequacies of the old timber sale contract have long been recognized.

Many clauses common to most sales, which were previously added to each contract, have been incorporated into the new form. The inclusion of more detail will save time and will tend toward standardization.

The new contract eliminates the fire-fighting previously required of a purchaser (without reimbursement) for fires within or near the sale area regardless of cause. He is still responsible, however, for suppression costs of fires caused negligently by his operation. The contract also provides that the purchaser be reimbursed by the Forest Service for suppression of fires not caused by his operation.

New York & Pennsylvania Doubles Finishing Facilities at Lock Haven Plant

Finishing facilities have been increased 100 per cent at the Lock Haven, Pa., plant of New York & Pennsylvania Co. According to the firm, the expansion was undertaken because of the greater demand for its Clarion offset papers.

In addition, New York & Pennsylvania is widening the wire of its No. 5 paper machine to 116 in.

At an outlay of $125,000, the company expanded and air-conditioned the finishing room. Floor space was increased by 7500 sq. ft. Air conditioning equipment, including capillary washers and conditioners manufactured by Air & Refrigeration Corp., controls temperature and humidity.

Relative humidity in the finishing room will be maintained at from 50 to 54 per cent, with dry bulb temperature at 72°F. This assures a uniform product.

A Harris-Seybold Co. cutter and trimmer speeds finishing operations. A Hayssen automatic ream wrapping machine and conveyor (I. J. White Corp.) has been installed, as have two Lynch Corp., Packaging Machine Div., wrappers.

Other equipment involved in the expansion at New York & Pennsylvania included: **Temperature and humidity recording equipment** — Brown Instruments Div., Minneapolis-Honeywell Regulator Co.; **hydraulic platform lifts** — Globe Hoist Co.; **motorized air lock door** — Peele Co. Inc.; **lighting fixtures** — Westinghouse Electric Corp.; **heating and humidifying system** — Jamar Olmen Co., and **layboy** — Maxson Automatic Machinery Co.

Plant Extension Underway at Richmond Pulp & Paper

Another plant extension that will house five Waterous grinders and other new equipment is underway at Richmond Pulp & Paper Co. of Canada Ltd., Bromptonville, Que.

The firm recently completed a $5,000,000 expansion, bringing mill capacity to an annual 75,000 tons of newsprint. The new project will further increase the mill's output. Completion is scheduled for fall.

Additional equipment will include new rotary screens, deckers, bull screens, stainless steel piping, etc. The 162-in. fourdrinier newsprint machine will be speeded up, equipped with anti-friction bearings, and a redesigned felt system. The existing winder will be redesigned for 3000-fpm vibration-free operation. Production on the machine is expected to increase 15 per cent.

SOME OF THE EARLY books and exhibits relating to papermaking at the Appleton museum are examined by Dean Harry F. Lewis of the Institute (l) and Dard Hunter, the museum's founder and director

Eighteen Centuries at Appleton . . .

Dard Hunter Museum at Home at Institute of Paper Chemistry

MORE THAN 18 centuries of papermaking are represented in the Dard Hunter Paper Museum now permanently displayed at the Institute of Paper Chemistry in Appleton, Wis. This unmatched collection gathered from all parts of the world was recently moved to the Wisconsin city from the Massachusetts Institute of Technology, where it had been located since 1939.

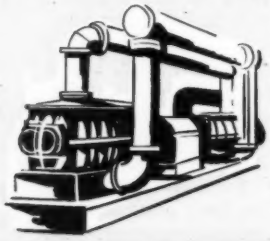
Mr. Hunter, museum director, was in charge of installation and arrangement.

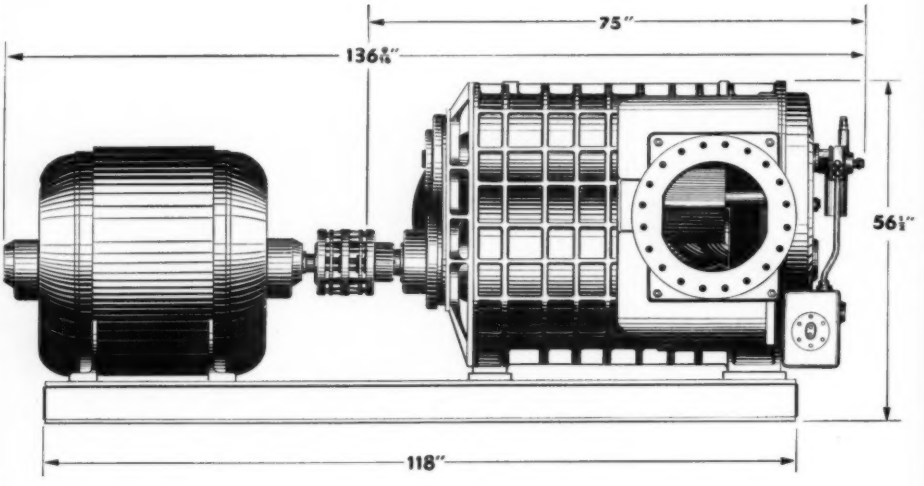
The display is so planned that a tour of the museum begins with paper specimens and ancient papermaking implements from China—the birthplace of paper in 105 A. D.—and concludes with the full-size equipment used by Mr. Hunter when he produced handmade paper as late as 1931 at his mill in Lime Rock, Conn.

Exhibits include the original type of *wove* fabric mould by which the earliest papermakers drained the water from a mixture of fiber and water to form a matted sheet. Bamboo

Vacuum Pump Users:

why use two-





400 HP motor
1200 RPM

Standardaire 175x32 Vacuum Pump
75 inches in length, weighs approximately 8,000 lbs.

WHEN ONE WILL DO!

A *Standardaire* Vacuum Pump with low horsepower and single-stage simplicity will do the same job for you as most double-stage pumps . . . and for less.

For example, the *Standardaire* 175x32 Single-stage Vacuum Pump operating at 1200 RPM is conservatively within the range of a 400 HP motor and gives the following tested CFM capacities—

20" HG	*22" HG*	*24" HG*
8,800 CFM	8,600 CFM	8,300 CFM

Figure what this means to you in savings. You can cut production costs, and save on floor space, too. This is possible because the ruggedly built, compactly designed *Standardaire* Pump offers you greater capacity per pound of pump than other pumps of equal weight and size.

Should you wish to stage two *Standardaires*, the same high capacities are achieved with a 25% saving in horsepower.

What's the secret behind the *Standardaire* capacities? Simple, rugged construction and *Standardaire's* exclusive, cycloidal screw type rotors which compress air in a wide range of pressures with a minimum of internal leakage.

There's a *Standardaire* Vacuum Pump designed to meet your exact requirements. Get all the facts today, write . . .

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BLOWER-STOKER DIVISION
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New York 17, New York

PORTION OF THE Dard Hunter Museum at the Institute of Paper Chemistry. The papermaking vat at the far end is Chinese in origin, while the one at the right is Japanese. Models of primitive mills in Indo-China and Kashmir are on the left

moulds, developed in Asia and still widely used there, represent the original type of *laid* transfer mould, the basis for all modern papermaking. European and American *laid* and *wove* moulds of brass wire show the last refinements in this essential tool of the paper artisan.

Early Mechanization

The beginnings of mechanization in the industry are indicated in numerous documents on display at the museum. These include the letters of John Gamble relating to his patent on the fourdrinier machine and early English patents for mechanical drying rolls.

Also on exhibit is a model of the first paper machine. The model was constructed from the inventor's original drawings.

Books and prints vividly describing the development of the "Hollander" cover the entire history of the maceration of papermaking materials from 1579 to the present.

Rare volumes by Jacob Christian Schäffer are among the collection of all known books relating to the evolution of papermaking fibers. At a time when Europe knew only cotton and linen rags as raw material, Dr. Schäffer, a Bavarian clergyman, published the results of his research on other fibers; these books contain 95 paper specimens made from such materials as wood, moss, hemp, straw, cattails, cabbage stalks, leaves and potatoes.

The museum boasts more than 100 original documents revealing the pioneer efforts and financial struggles of Matthias Koops, the first producer of commercial papers from wood, straw and discarded paper.

The Colored Watermark

Hundreds of specimens of watermarks trace the beginning of that art—about 1270—to the highest development of watermarked portraits in recent times. The museum has all the original experiments of Sir William Congreve, the inventor of the colored watermark. This development was designed to thwart the host of counterfeiters that appeared in England at the beginning of the 19th century. Congreve's work is the basis for the present-day British money papers.

Americana in the Dard Hunter collection includes a mill journal recording events during the time of George Washington, Washington's correspondence paper bearing his individual watermark, the diary of a Kentucky papermaker giving the most complete account of early American papermaking, and numerous ream labels for mills in operation 150 years ago.

Paralleling the course of papermaking through the ages, the museum provides an account of the development of printing. Specimens of Japanese prayers, or *dharani,* prepared about 770 represent the world's first printing on paper. Oriental decorative papers of striking design and color are displayed beside the wood blocks from which each was printed.

Three styles of early hand printing presses are shown along with machines used by Mr. Hunter in founding his own type for the books he has written and printed.

The museum is the result of more than 40 years of research and 250,000 miles of travel by its founder and director. He has sought specimens of paper and papermaking implements in India, Germany, Great Britain. He is the author of 23 books on hand papermaking, eight of which were produced on his own presses and on his own handmade paper.

News of the Industry . . .

Scott to Spend $6,000,000 at Detroit Division

Scott Paper Co. plans the investment of $6,000,000 to expand and convert its new Detroit Div. The program includes the installation of a new paper machine, the conversion of two existing machines, and the construction of a series of connected buildings adjacent to the present plant.

According to the firm, the move is part of a program to double the current output of the Detroit unit in the next five years. The new buildings will house additional pulp storage, paper finishing and shipping areas, laboratory and office space, and employee facilities.

American Box Expansion

American Box Board Co. of Grand Rapids, Mich., plans the construction of a plant in Kalamazoo for the production of corrugated shipping containers. The announcement was made by Robert K. Stolz, vice president.

The plant is to be located on an 18-acre tract just outside the city limits. Construction plans will soon be completed, and actual construction will start within the next few months.

In another expansion move, American Box Board has announced its merger with Lewis Container Co. of Colby, Wis. Lewis will be operated as a subsidiary.

The Wisconsin firm was established in 1951 by E. W. Lewis, president. Among the board of directors are D. C. Everest, board chairman of Marathon Corp., and Aytch P. Woodson, an officer and director of Mosinee Paper Mills Co., Masonite Corp., Marathon, Bay West Paper Co., and Employers Mutual Liability Insurance Co.

(Turn to Page 165)

YOUR EXPERIENCE + THE EXPERIENCE OF OTHERS = MORE PROFITABLE OPERATIONS FOR YOU

Papermaking, today, demands a wide variety of experience and know-how to meet the problems arising from the rapid growth of the industry in recent years.

What better way is there to get experience and know-how than by sharing our knowledge with others insofar as the sharing is mutually profitable to everyone concerned? It is on that very concept of sharing that The American Pulp and Paper Mill Superintendents Association has operated to advantage since its founding in June 1919.

An imposing list of pulp and paper industry experts and experts in the allied industry are to share their knowledge and know-how with the entire industry through their participation in the **36th Annual Convention of the Association.** The Convention, **opening on the morning of June 14, 1955,** and **closing on the evening of June 16, 1955,** will feature addresses and talks on dealing with people — both within and without the plant. There also will be many highly important papers for specialized group meetings on coating, paperboard, pulpwood, high-yield pulping, engineering and maintenance, and paper machines. In addition, answers to numerous problems of immediate importance to mill executives will be sought in a forum session which is being arranged just for that very purpose.

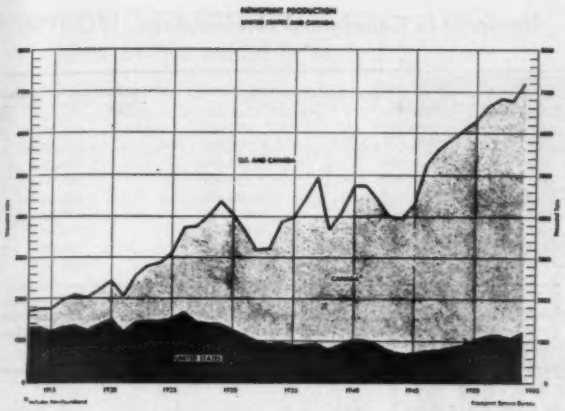
If you feel that you haven't all of the answers, and would like to learn what others may know, and possibly may desire to contribute something yourself, be sure to make arrangements now to attend the Convention.

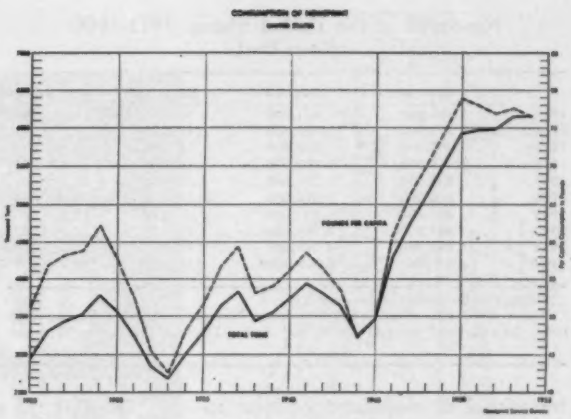
Write or wire your hotel requirements today to the

Netherland Plaza Hotel
Cincinnati, Ohio

Advertisement —

The American Pulp and Paper Mill Superintendents Association
327 South LaSalle Street, Chicago 4, Illinois





Newsprint Production in 1954 Reaches All-Time Peak in U. S. and Canada

NEWSPRINT PRODUCING facilities in North America were called upon during 1954 to produce a greater volume than at any time in the past, as demonstrated by the all-time peak output of 7,195,000 tons, 5.3 per cent higher than the previous high (1952) and 5.7 per cent above 1953.

In the annual report of the Newsprint Service Bureau, J. J. Zima, secretary, points out that while a substantial contribution to the 1954 output came from new machines first brought into production during the year and some others normally devoted to the production of other grades, the major portion of the increase was obtained from the industry's older producing units.

Contrasted to the momentary pause in newsprint production expansion in North America during 1953, the advance to record heights resumed in 1954 received much stimulus from an increased demand on the export market.

61% of World Total

The 1954 North American newsprint output represented perhaps 61 per cent of an estimated record global aggregate of about 11,800,000 tons.

In 1946 and 1947 U. S. and Canadian mills accounted for nearly 75 per cent of the world tonnage. However, despite almost uninterrupted production expansion, by 1954 their combined proportion of the over-all total had declined by 18 per cent.

Prior to 1954, the U. S. high had been attained in 1952 and included a substantial volume produced by other than the regular manufacturers of newsprint. Output in 1954, including a smaller quantity of similarly produced tonnage, amounted to 1,211,000 tons and exceeded the 1952 volume by 64,000 tons, or 5.6 per cent, and that of 1953 by 127,000 tons, or 11.7 per cent. Between 1946 and 1954 production rose by 440,000 tons, or 57.1 per cent.

Accounting for more than 60 per cent of the volume of pulp and paper produced in Canada, the newsprint mills in that country achieved a peak output of 5,984,000 tons in 1954. That volume topped the previous peak output (1953) by 263,000 tons, or roughly 4.5 per cent, while relative to 1946 there was an increase of 1,478,000 tons, or almost one-third.

Consumption of Newsprint Paper in the United States

	Tons	Per Capita
1954	6,163,000	76.5 lb.
1953	6,143,000	77.6
1952	5,988,000	76.9
1951	5,975,000	77.9
1950	5,937,000	78.8
1949	5,529,000	74.1
1948	5,141,000	70.4
1947	4,753,000	66.3
1946	4,296,000	60.8
1941	3,930,000	58.7
1929	3,780,000	62.2

World Production of Newsprint Paper
(Thousand short tons)

	World Total	United States and Canada*	% Produced in United States and Canada*	% Produced in All Other Countries
1954	11,800 (P)	7193	61	39
1953	10,931	6805	62	38
1952	10,611	6834	64	36
1951	10,252	6641	65	35
1950	9,736	6293	65	35
1949	9,131	6076	67	33
1948	8,430	5850	69	31
1947	7,653	5646	74	26
1946	7,084	5277	74	26

(P) Preliminary
*Including Newfoundland

1955 Potential Above 54's

Excluding the tonnage made by mills other than the regular producers, the ratio of production to estimated U. S. capacity in 1954 amounted to 92.5 per cent. The apparent less-than-complete utilization of capacity is due largely to the use on other paper grades of machines formerly devoted to and still capable of producing newsprint.

According to the Newsprint Association of Canada, mills in that country operated at a little better than 101 per cent of 1954 capacity. This was the eighth successive year in which better-than-capacity production was recorded.

North America's newsprint potential for 1955 will rise by about 274,000 tons to 7,473,000 tons, with 47 per cent of the increase in the U. S. and 53 per cent in Canada. Should capacities be fully employed in 1955, the U. S. mills would be able to turn out 16 per cent more newsprint than in 1954, while Canadian producers' output could increase by nearly 2.5 per cent.

(Export, import and consumption data for the U.S. and Canada will be found in tables accompanying this article.)

Concluding his report, Mr. Zima declared that, barring any upsetting in-

Newsprint in the United States, 1913-1954
(Short tons)

	Production	Imports	Exports	New Supply
1913	1,305,000	147,000	50,000	1,402,000
1918	1,260,000	602,000	110,000	1,752,000
1923	1,485,000	1,308,000	16,000	2,777,000
1928	1,418,000	2,157,000	11,000	3,564,000
1933	946,000	1,793,000	11,000	2,728,000
1938	820,000	2,274,000	6,000	3,088,000
1943	805,000	2,637,000	35,000	3,407,000
1948	867,000	4,393,000	28,000	5,232,000
1953	1,084,000	5,006,000	47,000	6,043,000
1954	1,211,000	4,997,000*	135,000*	6,073,000

*Data for December 1954 estimated
Note: Production data compiled from Newsprint Service Bureau Records. Imports and exports on United States Dept. of Commerce reports.

Newsprint in Canada and Newfoundland, 1913-1954
(Short tons)

	Production	Exports	Balance at Home
1913	402,000	310,000	92,000
1918	770,000	666,000	104,000
1923	1,330,000	1,200,000	130,000
1928	2,612,000	2,443,000	169,000
1933	2,282,000	2,135,000	147,000
1938	2,893,000	2,688,000	205,000
1943	3,219,000	3,073,000	146,000
1948	4,983,000	4,703,000	280,000
1953	5,721,000	5,375,000	346,000
1954	5,984,000	5,522,000	462,000

Note: Production compiled from NSB and NAC records. Exports are based on DBS data for Canada including Newfoundland beginning with 1949 and prior thereto represent a combination of mill reports of shipments from Newfoundland and DBS export data for Canada.

ternational developments, business activity in the U. S. in 1955 is generally expected to rise moderately above the levels of 1954. A few of the forecasters even envision the possibility of the 1953 peak being surmounted.

Over-all, the outlook is for a maintenance of business in general on a high plane in 1955, a derivative of which should be the use of a large and perhaps record volume of newsprint in the United States. In conjunction with early indications that overseas demand may be even greater than in 1954, it appears quite likely that expanded North American newsprint capacity may be quite fully utilized in 1955.

AMONG PRINCIPAL FIGURES at the recent meeting of the Community Relations Committee, Ohio Paper Industry were (l to r) Ohio Governor Frank J. Lausche; Reuben B. Robertson Jr., president of Champion Paper & Fibre Co., and D. G. Driscoll, president of Sorg Paper Co.

Good Community Relations the Big Pulp and Paper Problem: Tinker

THAT THE PULP and paper industry is probably one of the best examples of good public relations was the view expressed recently by E. W. Tinker, executive secretary of the APPA, before a meeting of the Community Relations Committee of the Ohio Paper Industry. The gathering was staged at Dayton March 23.

"If we are to retain our present economic system," he said, "it is impossible to isolate our mutual interests. The interests of management coincide with the interests of labor and of communities, political subdivisions and the national government. . . . The pulp and paper industry is probably one of the best examples we have of the practical working out of this problem."

Mr. Tinker pointed out that in the United States there are some 664 mills in 488 communities; 160 of these communities are over 50 per cent dependent on the pulp and paper industry. About 270,000 people are directly employed in the mills; these employees have well over 1,000,000 dependents. "The welfare of these communities and the employees and their dependents is a matter of great public concern."

Reviewing the good record that the pulp and paper industry has made in community relations, Mr. Tinker warned, however, that the record in itself is not enough. All efforts in this direction must be continued and strengthen. Without the mutual understanding of those affected by the well-being of the industry, he said, "the orderly development of the industry is impossible. And with such understanding the industry can contribute the maximum to the welfare of the people of the United States and, more particularly, to its employees and the political subdivision involved."

Two Primary Concerns

The record of the industry in the field of public relations has served the public interest. And that public interest, coupled with the national welfare, he continued, "has required a tremendous growth within the pulp and paper industry to supply our domestic needs. . . . Two things have been of primary importance: the profit position of the industry, and the permanence and stability of employment." In connection with profits, Mr. Tinker reminded his audience that they are the life blood, particularly of an expanding industry, that they are es-

sential to maintain a decent standard of employment and compensation and to expand job opportunities and production.

A Small Beginning

Mr. Tinker illustrated the vital part played by pulp and paper in the national economy. The industry pays about $650,000,000 in taxes and a freight bill of approximately $700,000,000. "To intelligent and patriotic statesmen," he declared, "our well-being is a matter of concern."

The paper industry for many years did a poor job in obtaining public understanding of the mutual benefits to be obtained through knowledge and consideration of problems affecting both it and the community. Mr. Tinker called the APPA community relations program a small beginning directed to this end.

New Officers Elected

Among other speakers who addressed the Ohio group were Frank J. Lausche, governor of Ohio; Reuben B. Robertson Jr., president of Champion Paper & Fibre Co.; D. G. Driscoll, president of Sorg Paper Co., and Jess Holderby, vice president of Rhinelander Paper Co.

Newly elected head of the Community Relations Committee is H. W. Nichols Jr., vice president of Fox Paper Co. He succeeds Mr. Driscoll. W. A. Johnson, mill manager for Pollack Paper Corp., was named vice president.

$6,000,000 Expansion by Manitoba Paper

Manitoba Paper Co. Ltd. of Pine Falls, Man., will expand its newsprint mill in a $6,000,000 two-year program. (The firm is a wholly owned subsidiary of Powell River Co. Ltd.)

Work is scheduled to begin this year and will include the remodeling of the 28-year-old mill and operational speed-up involving the latest techniques and designs.

Production at the Pine Falls plant has increased from a daily 250 tons in 1927 to almost 400 tons today. That figure will approach the 500-ton mark with completion of the present expansion. The mill uses spruce, balsam (80 per cent), jackpine and poplar (20 per cent), one-fifth of the supply coming from sources that were considered uneconomic only a few years ago.

(Turn to Page 168)

TISCO Pulp Wood Chain

TISCO Manganese Steel Chain lasts from 5 to 15 times as long as other chains in severe service.

In the Pulp and Paper Industry, TISCO Pulp Wood Conveyor Chain gives outstanding performance. The low frictional loss of manganese steel and the wide bearing area of the chain on conveyor trough result in substantial power saving and reduced wear.

TISCO Barking Drum Chain, is made to a greatly simplified design that not only increases strength but reduces the number of parts and expedites assembly. It is far and away the most economical barking drum chain made. It fits all sprockets and idlers. The center link is one integral unit. There are no bushings to work loose or break. Large bosses on the side links increase bearing on the pins, and greatly reduce both pin and link wear.

Attachment links specifically designed for most efficient log handling are readily available for use with TISCO Chain.

TISCO chain users report decreased maintenance expense from increased life of Manganese Steel Chain with fewer shutdowns for replacement.

Ask for further information regarding TISCO Chains for the Paper Industry.

TAYLOR-WHARTON Iron & Steel Co.

(Division of Harrisburg Steel Corporation)

HIGH BRIDGE 5, NEW JERSEY

Birmingham, Ala. Cincinnati, O. Easton, Pa.

DETAILS OF A construction project are worked out in the purchasing offices at the Ohio Div. Francis Ribar (l), purchasing supervisor, discusses the problems with Glen Ruff, a Hamilton contractor, and Fritz Kattau, company engineer

HUGE QUANTITIES of raw materials are consumed daily at the Champion mill. Some of the big items are purchased by headquarters for all three divisions. Considering the important ones are Mr. Ribar (l) and Malcolm MacDonald, director of purchases

Aspirin for the headaches . . .

Foresight + Market Knowledge = Smart Purchasing at Champion

"MARKETING" is more than a full-time job at the Ohio Div. of Champion Paper & Fibre Co. at Hamilton, Ohio. It literally ranges from soup to nuts, and each item no matter how small or seemingly insignificant must be bought with almost exasperating care. No wonder the division's purchasing department finds itself acquiring more than 17,000 aspirin tablets and capsules each month.

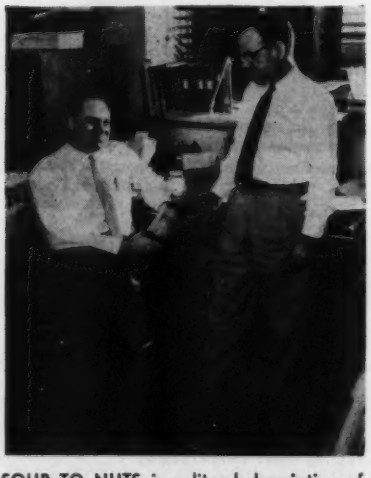
The aspirin and aspirin compounds consigned to the Medical Department are only a tiny fraction of the more than $1,000,000 the purchasing department spends each month, but require the same study as do such big items as coal, alum, starch or casein.

Heading this headache-producing operation is Malcolm MacDonald, director of purchasing. He and his expert staff have a truly man-sized assignment: to see that quality equipment and supplies for all phases of papermaking are where they are needed when they are needed and at reasonable cost.

Enough Milk for Dayton

The Ohio Div.'s purchasing supervisor, Francis Ribar, is the plant's milk man. It is one of his many tasks to assure an adequate supply of casein for the coater. No small job. The milk used in one day in the city of Dayton would keep the division's operations supplied for only 24 hours. And if it slips his mind he would find it rather difficult to make good his mistake. It takes a dairy of more than average size to provide 400,000 quarts on short notice.

Smart and efficient purchasing requires the careful consideration of three important factors, no one of which can take precedence over another—quality, nearness of supply, and price. While money-saving purchasing is always the goal, of course, quality cannot be sacrificed. To the purchasing agent that means knowing



SOUP TO NUTS is a literal description of the items purchased. Here, Ralph Greene holds the "soup," a term for photographic developer, while Dick Collopy inspects nuts from the storeroom

TYPING ORDERS. Jane Haddix uses a carbon separator that separates carbon copies from the continuous form. Records, forms and duplicate copies are required for the $12,000,000-per-year operation

MOUNTAINOUS stacks of catalogues are maintained by the Ohio Div. purchasing department. Referring to the extensive library are Ruth Donges, Ray Brubaker and Muriel Burkey

the markets, knowing the suppliers and promoting honest competition among vendors.

From Mops to Coal

Champion Paper's suppliers number in the hundreds. They include some of the world's largest as well as some of the smallest. A two-man firm in Hamilton satisfies the division's needs in brooms and mops, but gigantic industrial corporations are just as important.

An example of dollar-saving is consolidated purchases. On items which are used in vast quantities at two or more divisions, the shopping is undertaken at the Champion general offices in Hamilton and consigned to either the local plant, Canton, N. C. or Pasadena, Texas. Such items as coal, alum or starch used by all divisions give opportunity for quantity buying and thereby make considerable savings possible.

And finally comes the question of foresight. Although purchasing department staffers don't use the crystal ball, their planning-ahead is almost of those proportions. They must order far in advance of actual need to assure that there will be no preventable down-time in the mill. If materials and storeroom supplies are wasted in the plant, the men who do the buying must spend extra time—and money. And it wrecks their plan of buying. They can't run next door for a cup of clay when excessive waste dwindles the supply.

Summer Course on Paper Offered at Lowell Institute

The paper engineering department of Lowell Technological Institute at Lowell, Mass., has announced that a summer course in "Paper—Its Properties and Uses" will be given June 20 through July 1. It has been endorsed by the Boston Paper Trade Association.

Instructors will be Prof. John Lewis, head of the department, Prof. Norwood H. Keeney and several guest lecturers. No prerequisites are required, and all high school graduates are eligible.

The program is to be divided during the second week. One section will deal with fine papers, while the other will be concerned with coarse papers. All students will participate in the first week's schedule. Subjects to be discussed during the first week will include: an introduction to paper and board manufacture; an introduction to pulp manufacture; papermaking; board making; paper and board testing; paper and board classification; papermaking arithmetic, paper coverage and cost calculations.

The second week will be devoted to problems in the fine and coarse paper fields and will be made applicable to specific paper types. Subjects will include printing, economics of paper sales and paper problems from the sales angle. Mill visits are planned.

Ontario's Sioux Lookout Area Surveyed for Mill

Anglo-Newfoundland Development Corp., controlled by the Rothermere newspaper interests in Great Britain, is undertaking an extensive survey of the Sioux Lookout region of northwestern Ontario. It is expected that if the survey is optimistic the firm will construct a $50,000,000 paper mill in the area. (Sioux Lookout is more than 125 miles northeast of Kenora.)

According to Clare Mapledoram, Ontario lands and forest minister, Anglo-Newfoundland has been granted an 18-month license to survey the Lac Seul Forest to determine whether the wood supply is ample for a mill of the size planned.

Union Bag to Modernize

Approximately $18,000,000 is to be spent by Union Bag & Paper Corp. in a modernization program at its Savannah, Ga., plant. The project will span a five- to six-year period.

In reporting the plan, Alexander Calder, president, noted that the firm realized last year the highest tonnage sales of kraft packaging products in its history. Net dollar sales were second only to the record set in 1953, and net earnings were up 9 per cent.

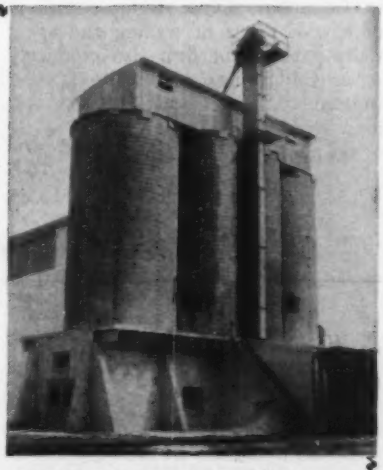
The modernization program recently approved will see the replacement of heavy equipment that has been in service at Savannah for 15 or 20 years.

C-Z Canada Begins Lulu Island Plant Construction

Crown Zellerbach Canada Ltd. was to begin construction in May of its $4,000,000 box factory and paper converting plant on Lulu Island near Vancouver, B. C. Completion is scheduled for late this year.

Key piece of equipment in the plant will be the giant 96-in. Samuel M.

Interesting group of 6 NEFF & FRY BINS



You see four bins in the photograph. There are two more of the 12 ft. dia. bins between the 20 ft. ones. All six are used for handling glass batch materials—lime, feldspar, silica sand, cullet, etc.

This is an example of the bins we construct all over North America for handling and storing scores of flowable bulk materials. In our long experience, we have designed structures and accessories to meet almost every conceivable situation.

The distinctive feature of a Neff & Fry bin is the diagonal, interlocking Super-Concrete Stave. Hoops of heavy galvanized steel rods cross the diagonals of two staves in each vertical tier. As many intervening hoops are applied as needed to give a safety factor of five to one.

Our bins do not spall, rust, rot, or burn. They do not require face-lifting.

You are invited to communicate with us for literature and specific data.

THE NEFF & FRY CO.
250 ELM ST. • CAMDEN, OHIO

NEFF & FRY ➧ SUPER-CONCRETE STAVE STORAGE BINS

News of the Industry . . .

Langston Co. corrugating machine. Fifteen feet wide and 320 ft. long, the installed cost of the unit has been estimated at $550,000. It will operate at speeds up to 500 fpm, with a rated capacity of 8 tons per hour, double that of existing equipment.

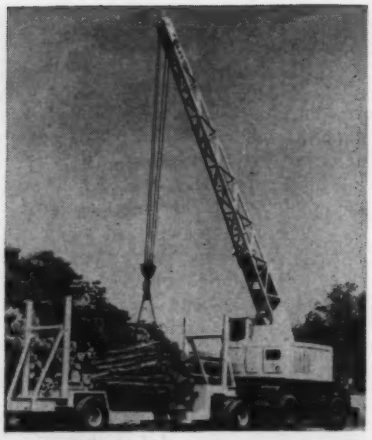
Features of the Langston machine, according to C-Z officials, include: (1) a continuous running double-backer; (2) hydraulic loading of corrugating and pressure rolls in the single-facer units; (3) hydraulic shaftless mill roll stands; (4) a glue unit for laminating the corrugating medium; (5) Reliance variable speed electric drives, and (6) a double right-angle delivery and take-off unit.

St. Regis Acquires Dallas Firm; Will Add Machines in Florida and Washington

St. Regis Paper Co. has announced the acquisition—through an exchange of stock—of Pollock Paper Corp. of Dallas, Texas. Details of the transaction were to be announced later.

Pollock is a manufacturer of waxed paper and operates a one-machine mill at Columbus, Ohio, for production of a wide range of waxing and specialty papers. The firm also produces set-up folding boxes and cartons, corrugated containers and paraffin cartons.

St. Regis has also revealed its decision to proceed at once with the installation of new kraft paper and board machines at Jacksonville, Fla., and Tacoma, Wash. The two units will require the expenditure of $40,000,000 and should be in production in two years' time.



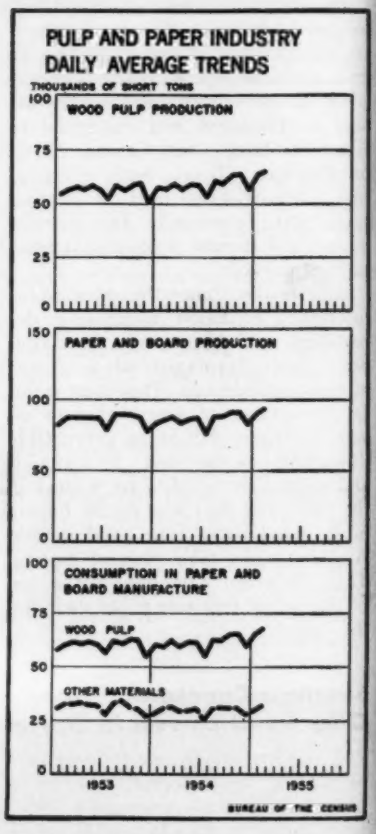
HANDLING CEDAR sawlogs at a southern lumber firm, this mobile crane is typical of the modern equipment that is speeding materials handling operations in the woods products industries. The 12-ton gas-electric unit made by Coles Cranes Inc. has been adapted to transporting pulpwood, has a 360° swing and a cantilever type boom. Always a time- and money-consumer, materials handling has developed into one of the industry's smoothest and most economic operations

---

Marathon Corp. was to break ground in April for its manufacturing plant in Neenah, Wis., that will produce labels and specialty products for food and general packaging.

February Pulp, Paper and Board Production

Paper and board production during February amounted to 2,249,720 tons, according to a report released by the Bureau of the Census. This is more than 10 per cent above the 2,043,200 produced in February a year ago. Paper production amounted to 989,056 tons, which is more than 7 per cent above the 920,211 of the same month in 1954. The output of paperboard during the month was 1,025,116 tons, reflecting an increase of more than 12 per cent above the production of 911,720 reported last year.



Pulpwood Receipts at the pulp mills during February amounted to 2,690,233 cords, with consumption at 2,511,216 cords. Month-end inventories increased to 5,563,146 cords.

Wood Pulp Production during February amounted to 1,564,479 tons, as compared to the 1,371,003 tons produced during the same month in 1954.

Wood Pulp Inventories at the end of February at the paper and board mills amounted to 488,610 tons, showing a decrease of less than 1 per cent during the month.

U. S. Paper and Paperboard Production

	Feb. 1955 (tons)	Jan. 1955 (tons)	Feb. 1954 (tons)	Total 1954* (1,000 tons)	Total 1949
Paper and Board, total	2,249,720	2,344,549	2,043,200	26,657	20,315
Paper, total	989,056	1,040,061	920,211	11,615	9,198
Newsprint	109,560	110,530	87,236	1,191	918
Groundwood paper (uncoated)	64,101	70,206	63,110	808	675
Printing and converting (coated)	100,085	105,333	93,811	1,215	887
Book paper (uncoated)	131,204	138,340	127,073	560	1,416
Fine paper (writing, cover and text, bristols, thin paper and other)	116,663	121,499	102,297	1,324	1,015
Coarse paper (unbleached kraft, glassine, greaseproof, vegetable parchment and other)	293,089	302,253	278,203	3,429	2,758
Special industrial paper (including absorbent paper)	45,259	52,252	40,968	526	334
Sanitary tissue stock	108,347	119,073	107,763	320	1,008
Tissue paper (except sanitary and thin paper)	20,748	20,575	19,750	241	187
Paperboard, total	1,025,116	1,053,884	911,720	12,047	8,997
Container board, total	550,670	578,470	469,284	6,433	4,680
Liners	374,336	391,052	314,941	4,336	3,132
Corrugating material	153,556	161,033	133,491	1,817	1,306
Container chipboard	22,778	26,385	20,852	280	242
Bending board	307,023	305,415	291,611	3,671	2,613
Nonbending board	75,275	78,389	72,684	920	748
Special paperboard stock	84,949	85,069	72,331	944	873
Cardboard	7,199	6,541	5,810	79	83
Wet machine board, total	12,019	11,845	11,355	132	131
Construction paper and board, total	223,529	238,759	199,914	2,863	1,990
Construction paper	97,023	100,365	94,077	1,356	1,151
Hardboard and insulating board	126,506	138,394	105,837	1,507	839

*Preliminary report. *Source: U. S. Department of Commerce.*

FOR CONTINUOUS, ECONOMICAL SEMI-CHEMICAL PULPING . . .

AMERICAN DEFIBRATOR, Inc. OFFERS

ROTARY FEEDERS...for introducing materials to be processed into steam pressure vessels.

CONTINUOUS COOKERS...where cooking time can be varied and controlled from 10 minutes to 2 hours as required.

ASPLUND DEFIBRATORS...for separating fibers of softened cellulose materials for maximum yield and uniformity with minimum power consumption.

DAVENPORT PRESSES...for dewatering pulp and paper stock to high densities.

DEFIBRATOR BARK PRESSES...for reducing moisture content of wet bark to 55% or less, for use as fuel.

This complete line of equipment is mill-proven and low in operating and maintenance costs. Our continuous pulping equipment is available to suit your specific needs in units for producing 75 tons of pulp or more per day. Write us for detailed information, facts and figures.

AMERICAN DEFIBRATOR, INC. CHRYSLER BUILDING NEW YORK 17, N.Y. West Coast: A. H. Lundberg Orpheum Building, Seattle, Wash.

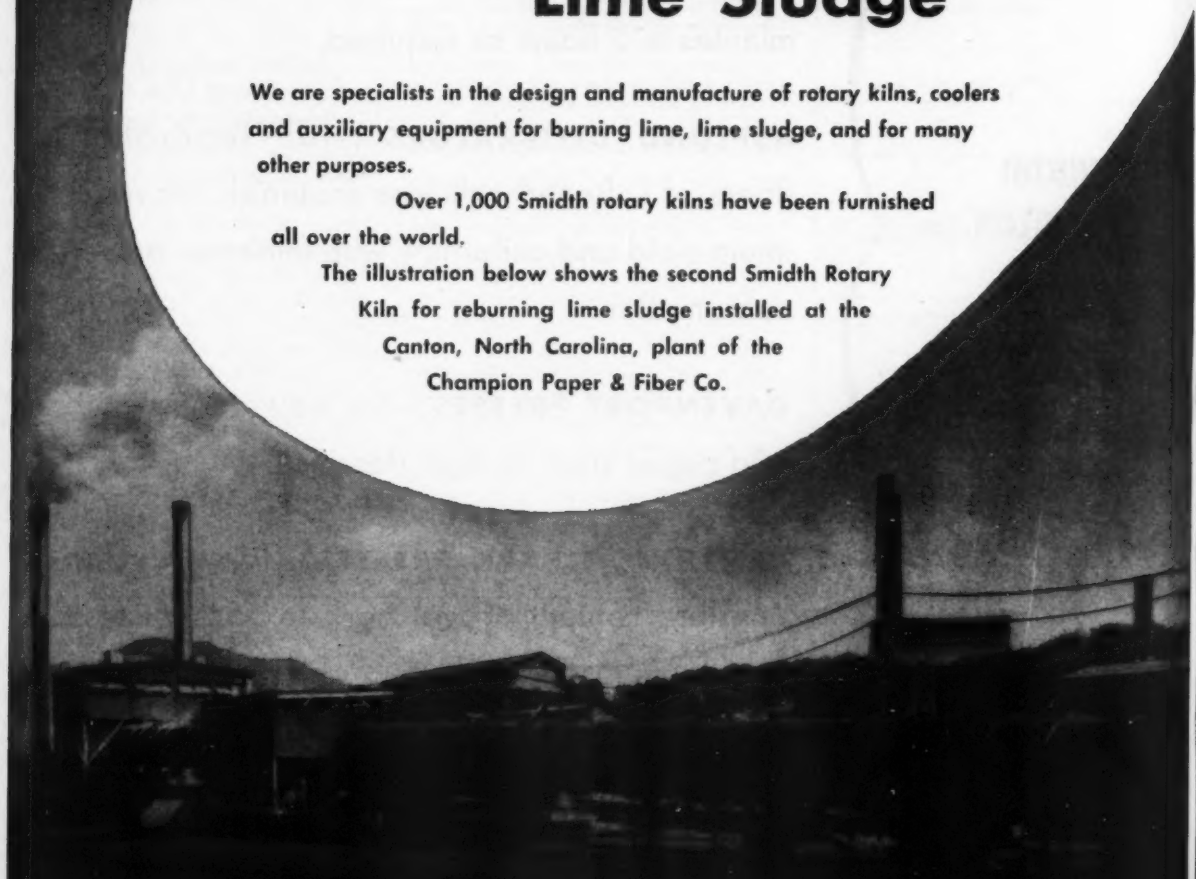
SMIDTH Rotary Kilns

For reburning Lime Sludge

We are specialists in the design and manufacture of rotary kilns, coolers and auxiliary equipment for burning lime, lime sludge, and for many other purposes.

Over 1,000 Smidth rotary kilns have been furnished all over the world.

The illustration below shows the second Smidth Rotary Kiln for reburning lime sludge installed at the Canton, North Carolina, plant of the Champion Paper & Fiber Co.



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42 Queen's Road
Bombay, India

ALLIED NEWS

Shell to Build New Hydrogen Peroxide Plant

Shell Chemical Corp. has started construction of a hydrogen peroxide plant at Norco, La. According to R. C. McCurdy, Shell president, the annual design capacity will be more than 30,000,000 lbs. (on 100 per cent H_2O_2 basis).

While a large part of the H_2O_2 output will be used by the firm in the manufacture of glycerine by a new process, substantial quantities will be available to the pulp and paper industry for pulp bleaching.

According to the company announcement, the large hydrogen peroxide-producing facilities, which are expected to be in operation in about two years, will tend to lower the price of this important bleaching agent.

Stowe-Woodward Opens New Plant in Georgia

The latest techniques in the art of rubber roll compounding and covering were on display for papermakers May 3 and 4 at the new plant of Stowe-Woodward Inc. in Griffin, Ga. The firm held open house for prospective customers in the southern states.

Put into production early this year, the Griffin plant marks the second major expansion undertaken by the firm during the past 12 months. A similar open house and dedication was held last June at the S-W plant in Neenah, Wis.

Complete facilities for the covering and finishing of all types of papermaking rolls in sizes far beyond those in use today were on display, and visitors were shown actual rolls in the various stages of manufacture. The plant is said to be the most modern of its type in the world and is designed specifically for the unusual production flow and work area requirements of rubber roll manufacture.

Allied News Notes

Oldbury Electro-Chemical Co. has announced that it will soon start construction of an addition to its Mississippi works in Columbus. Plans have been completed for the expansion of sodium chlorate production facilities.

Albert Lob Maschinen und Apparatebau GMBH of Dusseldorf, Germany, has appointed H. E. Overacker of New York, N. Y., as exclusive sales representatives in the United States and Canada. Equipment produced by the German firm includes pressure regulators, temperature regulators, water level control systems, full lift safety valves, etc.

Dilts Machine Works Div. of the Black-Clawson Co. has expanded its converting laboratory facilities at Fulton, N. Y. The move was made in order to accommodate a wider range of coating applications and customer problems.

American Cyanamid Co. has announced the installation of special facilities that can produce a wide range of cheemical compounds and embody numerous processes. The facilities, according to the firm, "will assure our customers a dependable source of larger-than-usual quantities of new chemicals that have not yet become commercial and provide a means of evaluating such products in terms of their long-range commercial possibilities."

West End Chemical Co. will begin producing salt cake and anhydrous sodium sulfate by mid-summer. It will be extracted from natural brine deposits at Searles Lake, Cal., and processed by special equipment now under construction.

The Wellsvile Works and Steam Turbine Sales Div. of **Worthington Corp.** are being merged and will be known as the Steam Turbine Div. Arthur F. Reinking, for the past four years manager of the Steam Turbine Sales Div., has been made general manager.

The eastern regional sales office of the Alloy Tube Div. of **Carpenter Steel Co.** has been moved to the division's home office and mill in Union, N. J.

Warren Steam Pump Co. Inc. has announced that all business formerly conducted at Belmont, Mass., is now being handled at the Chamber of Commerce Building, 80 Federal St. in Boston.

The Kelco Co. has moved its New York, N. Y. offices to more spacious quarters at 120 Broadway. The offices were formerly at 31 Nassau St.

Sartorius-Fischer at Gottingen, Germany, is an affiliate recently organized by **Fischer & Porter Co.** of Hatboro, Pa. The firm will manufacture and sell industrial process control instrumentation and chlorinators. F&P already has plants in operation in England, France and Holland.

Worthington Corp. has moved its Detroit District office from 2824 East Grand Blvd. to 13305 Puritan Ave. The move represents an expansion of nearly 100 per cent.

Allied Personalities

Ronald G. Goodwin has been named sales manager of the Pandia Inc. Div. of the Black-Clawson Co. Formerly associated with Taggart Corp. and Solvay Corp., he joined Pandia in 1946 as director of research in charge of installation work.

R. G. Goodwin

M. Nielsen

M. Nielsen, vice president of the Babcock & Wilcox Co., has been named by the board of directors to the newly created post of executive vice president. He joined the firm in 1924 and in January 1954 was made vice president in charge of the Boiler Div.

Ralph Wechsler, formerly treasurer, has been elected president of Nopco Chemical Co. He succeeds Thomas A. Printon, who will continue as chairman of the board.

Stanley W. Johns has joined the engineering staff of John B. Kohler, paper consultant of Crystal Lake, Ill. Formerly with Charles Bruning Co., he will become chief of special project designs for Kohler. He was at one time a designer of special equipment for U. S. Gypsum Co.

S. W. Johns

Franklin Farrel III

Franklin Farrel III has been elected president of Farrel-Birmingham Co. Inc. to succeed Franklin R. Hoadley, who retired May 1. Mr. Farrel is the fourth generation of his family to be actively associated with the firm. He moves up to his new position from the office of executive vice president.

Aloysius M. Tullo, works manager for Worthington Corp. at Harrison, N. J., has been named general manager of the newly established Harrison Div. He will be responsible for all phases of opera-

Illustration By John Tenniel, From "Through The Looking-Glass," By Lewis Carroll

A WALRUS, A CARPENTER . . . AND THE ENGINEER

"The time has come," the Walrus said, "To talk of many things . . ."

Timely truths often hide behind the guise of whimsy. Lewis Carroll's walrus and his carpenter accomplice had good reason to talk of many inconsequential things . . . as their audience of oysters was to learn, alas, too late. We have equally good reason to quote their opening argument.

We agree with the walrus. As engineers we believe the time has indeed come to talk to business men of many things . . . not of shoes, or ships, or sealing-wax, or cabbages, or kings—but of the engineer and his position in your business program . . . of engineering services, of costs, of time—and profits.

This will be our objective in the forthcoming series of messages—to state clearly the function of professional engineering in your business, at a time when the services of a responsible engineering organization are more than ever vital to business success.

Engineers for 53 Years . . . **J. E. SIRRINE COMPANY**

GREENVILLE • SOUTH CAROLINA

A DEPARTMENTALIZED ENGINEERING ORGANIZATION SERVING BUSINESS, COMMERCE AND INDUSTRY

Allied News . . .

tions, including sales, engineering and manufacture.

Robert M. Zimmerman has been named general manager for operations of the Atkins Saw Div. of Borg-Warner Corp. He was formerly general manager of Delog Hook & Eye Co. of Philadelphia.

Robert E. Engley has been appointed manager of pulp and paper mill sales for Walworth Co., manufacturer of valves and pipe fittings. He succeeds Frank H. Cole, who retired December 31.

Dr. Ralph E. C. Fredrickson has been promoted to the position of director of the development engineering department of A. E. Staley Mfg. Co., Decatur, Ill. corn and soybean processor. He succeeds Dr. Walter G. Meyer, who has resigned to accept a position with Crown Zellerbach Corp. at Camas, Wash. Dr. Fredrickson joined the Staley staff in 1942 and has been senior engineer in the development department since its formation in 1944.

R. E. C. Fredrickson

F. W. Kopplow

Frederick W. Kopplow Jr. of Delton, Mich., has been appointed Midwestern representative for H. Waterbury & Sons Co. of Oriskany, N. Y. At one time on the staff of Sutherland Paper Co., he joined Waterbury in 1954 as a sales and service trainee.

Two executive promotions in industrial sales have been announced by A. E. Staley Mfg. Co. Robert L. Schuerman, department administrative assistant, has been named assistant manager of industrial sales in charge of sales to the paper and corrugating industries. James W. Hurley, manager of marketing and plans for the chemical derivatives section, has been made manager of research for the industrial sales department.

George E. Emigh Jr. has joined his father, G. Elmer Emigh, in representing Sandy Hill Iron & Brass Works in the sale of pulp and paper making machinery on the West Coast. The senior Mr. Emigh joined the Sandy Hill sales force in the summer of last year.

Sutherland Refiner Co. has announced the appointment of Lionel M. Sutherland as president to succeed his father, D. Mason Sutherland Jr., who is retiring as president and director of the firm. Douglas Sutherland has been named vice president and treasurer, and Mrs. Edna N. Barber secretary.

What, actually, do Vacuum Pumps on paper machines handle?

Paper mill engineers know that it is actually a mixture of air and water vapor, but the custom of rating vacuum pumps in terms of air capacity alone causes this important fact to be frequently overlooked.

The presence of this water vapor causes a considerable reduction of the effective air handling capacity of any vacuum pump except the Nash. In the Nash Vacuum Pump the bulk of this water vapor is effectively condensed, due to the Nash operating principle. The air handling capacity of the Nash is therefore not reduced.

That is one of the reasons why Nash Vacuum Pumps are standard in over a thousand leading Paper Mills.

NASH ENGINEERING COMPANY

443 WILSON ROAD, SO. NORWALK, CONN.

NAMES *in the* NEWS

Crane Named President of Byron Weston Co.

Robert Crane was recently elected president of Byron Weston Co. of Dalton, Mass.

Mr. Crane joined the organization early in 1929 as a salesman in New York City. For the next 11 years he traveled throughout the United States in the same capacity and in 1940 was called to Dalton as sales manager.

During the following years he served as a director, as secretary, vice president and since August 1954 as executive vice president of the firm.

Robert Crane

H. F. Dunning

Dunning Named Scott Director

Harrison F. Dunning, vice president in charge of manufacturing for Scott Paper Co., has been elected a director of the firm.

A graduate of Dartmouth College, Mr. Dunning joined Scott in 1935 as an industrial salesman. In 1941 he was appointed manager of the South Glens Falls, N. Y. plant of Marinette Paper Co., a wholly owned subsidiary.

From 1942 until 1947 Mr. Dunning was assistant to the Scott vice president in charge of production. Following an appointment as general manager of paper mills, he was in 1951 named general operating manager for all Scott mills. He was elected vice president in late 1951.

Fortier Retires at Everett

Louis Paul Fortier retired April 1 as general superintendent of Everett Pulp & Paper Co. (a division of Simpson Logging Co.) in Everett, Wash. He had completed more than a half century affiliation with the pulp and paper industry.

L. P. Fortier

Frank Hamilton

Mr. Fortier began his career in 1902 with Orono Pulp & Paper Co. (Basin mills) in Orono, Maine, and rose to prominence in several eastern mills. He joined the Everett staff in 1936 as superintendent.

Succeeding Mr. Fortier as general superintendent is Frank Hamilton, who came to Everett in 1951 as technical director. For the past two years he has been assistant general superintendent, in addition to his regular duties as technical superintendent. He was at one time assistant mill superintendent at Allied Paper Mills in Kalamazoo, Mich.

Dwayne Clark, for the past several years Mr. Hamilton's assistant, becomes technical superintendent.

St. Regis Promotions

St. Regis Paper Co. has announced the appointment of Justin H. McCarthy as vice president. He is chief engineer of the pulp and paper divisions.

Mr. McCarthy joined St. Regis in 1946 as plant engineer at the Tacoma, Wash., mill. In 1951 he was made resident engineer at Jacksonville, Fla., and in 1952 appointed chief engineer for the pulp and paper divisions. He will continue to make his headquarters in Jacksonville.

Prior to joining St. Regis, Mr. McCarthy had served as chief engineer for Soundview Pulp Co.

In further promotions, St. Regis has named the following assistant vice presidents: John K. Ferguson, assistant to Edward R. Gay, executive vice president; William W. Gordon, general sales manager for all Panelyte products; Gardiner Lane, director of product development; Bernard W. Recknagel, assistant secretary; Andrew F. Storer, assistant to the vice president in charge of sales, and Charles A. Woodcock, general sales manager of the Multiwall Packaging Div.

Hartung Advanced

St. Regis has also named J. W. Hartung as manager of the purchasing department. Formerly purchasing agent for the Kalamazoo, Mich., mill, he joined St. Regis in 1941.

Named assistant manager of the purchasing department was W. H. Monje. He has been with the firm since 1925, joining the purchasing department in 1946.

In the Manufacturing Division, the following appointments became effective April 15: A. Thomas Easley as acting resident manager of the northern New York paper mills at Deferiet, Carthage and Herrings; Lester J. Smith as general superintendent of northern New York paper mills, and R. Stanley Donaldson, formerly night superintendent at Deferiet, as superintendent at Carthage.

In another change at Deferiet, Joseph P. Powell, formerly assistant sulfite superintendent, has been promoted to the post of groundwood superintendent. He joined St. Regis in 1930 and was made assistant sulfite superintendent last January 1.

J. H. McCarthy

H. J. Trolin

Henry J. Trolin, formerly vice president in charge of production for Sitrue Inc., has been named to the newly created post of vice president in charge of manufacturing for Doeskin Products Inc. He was also elected a director of the firm. Sitrue recently became a part of the Doeskin firm.

Two Kinberly-Clark Corp. officials at Niagara Falls, N. Y., have been transferred to Fullerton, Cal., where they will take part in organizing and managing the firm's new mill. **Richard Anderson,** plant engineer at the Niagara Falls crepe wadding mill, will become chief engineer at Fullerton. **J. Calvin Young,** head personnel man, will become industrial relations supervisor.

Necrology . . .

Harry F. Rieck

Harry F. Rieck, paper mill superintendent for Chesapeake Corp. of Virginia at West Point, died recently. He was 57.

A native of Milwaukee, Mr. Rieck began his paper industry career there and later was associated with a mill in Gilman, Vt. He joined the Chesapeake staff in 1931. A member of the Superintendents Association, Mr. Rieck served as secretary-treasurer of its Southeastern Division in 1953-54.

M. H. Lund

Marquard H. Lund, well known in the paper industry, died recently while visiting his son in New Jersey. He was president of Waring Central Co. Inc., Brooklyn, N. Y., envelope manufacturing firm.

While establishing the envelope firm, Mr. Lund formed two specialty associations, the Paper Napkin Association and the Paper Food Tray Association. Both are now functioning along the lines he formulated.

During the administration of Herbert Hoover as Secretary of Commerce, Mr. Lund was named commercial attache in Scandinavia. He served the paper industry by furnishing information on foreign conditions.

Richard H. Kimball, mill manager for George O. Jenkins Co. of Bridgewater, Mass., died suddenly March 30 in St. Petersburg, Fla. Well known in the board industry, he had been associated with the Jenkins firm since 1919. He was 61.

J. Bryce Eakin, vice president and director of purchasing for St. Regis Paper Co., died April 5 at the age of 61. He joined the firm in Watertown, N. Y., in 1925.

Samuel G. Dunning, service consultant for Reliance Electric & Engineering Co. of Cleveland, died in Green Bay, Wis., recently while on a business trip. Sixty-three years of age, he had been associated with Reliance nearly 42 years.

Anton Nielsen, 69, former chief operating engineer for Hammermill Paper Co. in Erie, Pa., died April 2.

W. A. Roberts, president of Allis-Chalmers Mfg. Co. since 1951, died April 12 at the age of 57. He began his career with the firm in 1924 as a salesman in Wichita, Kans.

George C. Gill

George C. Gill, 97, retired paper manufacturer and banker, died at Holyoke, Mass., February 15.

Mr. Gill joined the staff of Chemical Paper Mfg. Co. in 1882 as a bookkeeper. He later became a partner in the firm and in 1893 purchased Winona Paper Co., renamed it George C. Gill Co., and sold it in 1900 to American Writing Paper Co.

Ray S. Bass, 59, treasurer and director of A. E. Staley Mfg. Co., Decatur, Ill. corn and soybean processor, died March 8. He had joined the firm in 1919 as an accountant.

Judson P. Smith, 49, wood development engineer for Wood Conversion Co. of Cloquet, Minn., died February 26. He had been previously employed as a chemical engineer by both Marathon Corp. and Kimberly-Clark Corp.

Joseph Waldeck, retired sales representative for Lunkenheimer Co., died January 20. At the time of his retirement in 1949, he had been with the valve firm 30 years.

The flying shuttle symbolizes speed and production —but with minute observation of every square inch of Lindsay Fourdrinier wire cloth. Whether with Lindsay Longcrimp or any special weave, only uniform quality is tolerated. The Lindsay Wire Weaving Company, Cleveland 10, Ohio.

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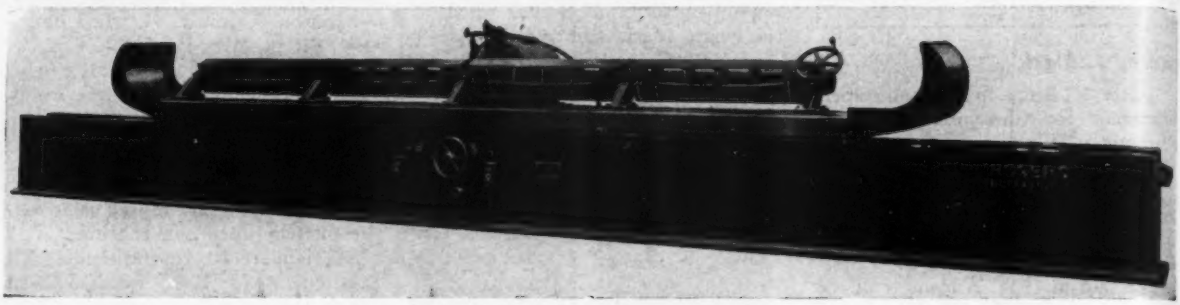

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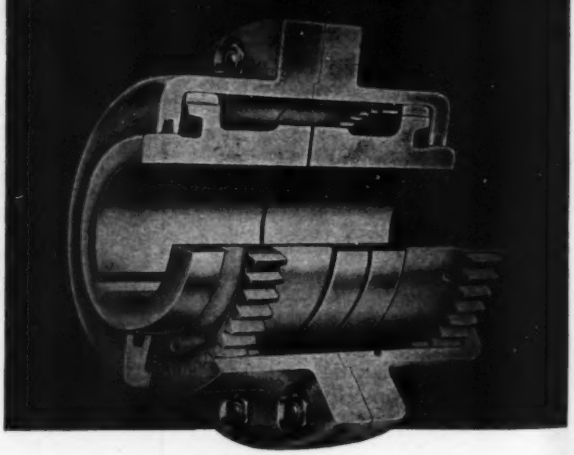

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ASSOCIATION NEWS

CPPA Woodlands Section Holds 37th Annual Meeting

HEAD TABLE at the annual luncheon of the CPPA Woodlands Section included (l to r) E. Porter, F. L. Flatt, F. L. Mitchell (CPPA general manager), J. V. Perrin, Dr. L. R. Thiesmeyer (president of Pulp & Paper Research Institute), F. A. Harrison, G. M. Hobart (president of Consolidated Paper Corp.), H. A. Sewell (1955-56 section chairman), A. C. Price (president of Price Bros. & Co.), Dr. Avila Bedard, Prof. J. L. McDougall, J. H. Merrill (1954-55 section chairman), A. A. Schmon (CPPA executive board chairman), R. G. MacFarlane and J. B. Harrison

SOME 800 FORESTERS, engineers and others interested in timber management met recently at Montreal for the 37th annual meeting of CPPA's Woodlands Section.

Keynoting the gathering, J. H. Merrill, 1954 chairman of the section's executive council, expressed concern for the lack of woodlands research by the industry as a whole. That research, he said, does not seem to be keeping pace with individual company efforts. However, Mr. Merrill added that recent work done by such organizations as the Pulp & Paper Research Institute of Canada has partially helped to dissipate the council's fear and has given hope for more attention being paid to those areas of forest research that have been seemingly ignored.

In conclusion, the speaker expressed the hope that some interesting developments will occur in the field of long-range weather forecasting and weather modification for industrial purposes.

Sewell Named New Chairman

Elected 1955-56 chairman of the section was H. Arthur Sewell of Thorold, Ont., general manager of woodlands for Ontario Paper Co. Ltd. and Quebec North Shore Paper Co.

M. MacLaggan, divisional woods manager for Abitibi Power & Paper Co. Ltd., who is serving his second year as a member of the council, was elected vice chairman.

During the three-day program the major topics discussed included the latest developments in forest management, woods operations and woods labor. In outlining the meeting, W. A. E. Pepler, manager of the section, stressed the importance of the pulp and paper industry's study and research in the field of forest management. These activities, he said, have increased the value of the woodlands to all Canadians. At the same time, the forests have been enabled to support an ever-growing demand for Canadian pulp and paper products, both here and abroad.

Speakers covered every aspect of forest operations from conservation and protection against fire, insects and disease to efficient methods of growing, handling and cutting wood. Twelve papers included discussions of camp recreation programs, tree breeding, and the economic aspects of intensive forest management.

Honor the Future

At the annual luncheon, J. L. McDougall, professor of commerce at Queen's University in Kingston, stressed the role of the corporation as legal persons with perpetual succession. He contrasted this with the private family ownership that rarely extends even to three generations. The corporation, therefore, is more inclined to honor the future instead of thinking in terms of immediate returns.

H. Arthur Sewell
1955-56 Chairman

J. H. Merrill
1954-55 Chairman

Winners of the various annual awards made by the section were as follows:

J. A. Bothwell Award (for meritorious work on behalf of forest conservation in Canada), Ernst Martinsson, general woods manager for Canada Paper Co., Montreal.

Ellwood Wilson Award (for the most effective industrial application of research projects instigated and carried out either by the section in cooperation with the Pulp and Paper Research Institute or by a member firm), J. C. Biggar and W. J. Charlesworth of the KVP Co. in Espanola, Ont.

Price Brothers Award (for the best paper on a subject other than mechanization), J. H. LeBlanc of Canadian International Paper Co., Three Rivers, Que.

Mechanization Award (for the best paper on logging mechanization), A. R. Conboy of Canadian International Paper Co., Clova, Que.

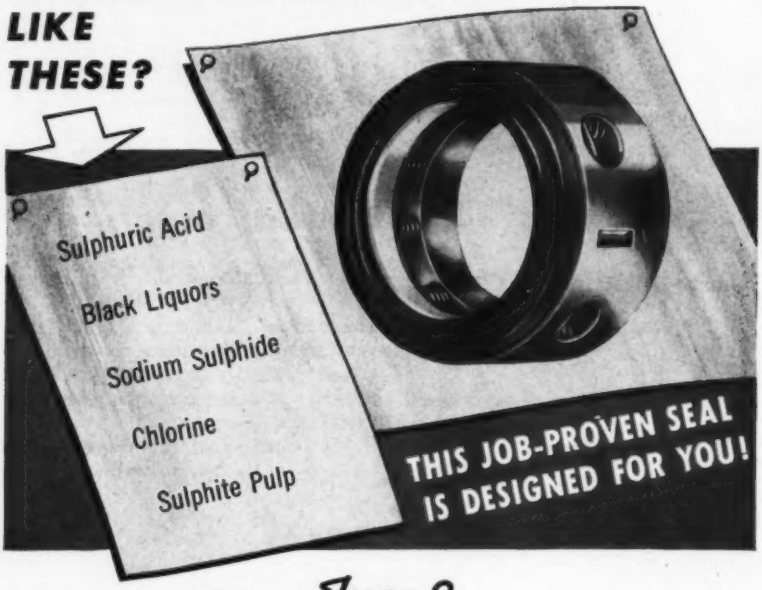
Consolidated Paper Corp. Ltd. Award (for the best paper on mechanical hauling based on actual experience), C. R. Cayouette and J. J. Fitzmaurice of Canadian International Paper Co. at LaTuque, Que.

High- and Low-Producers Contrasted at Meeting of Miami Valley Supts.

The good supervisor is an indispensible link in modern industry, according to Robert L. Miles, coordinator of personnel development at Gardner Board & Carton Co. Mr. Miles addressed a recent meeting of the Miami Valley Division of the Superintendents Association at Middletown, Ohio.

Mr. Miles contrasted the high-producing supervisor and the low-pro-

HANDLING CORROSIVES LIKE THESE?



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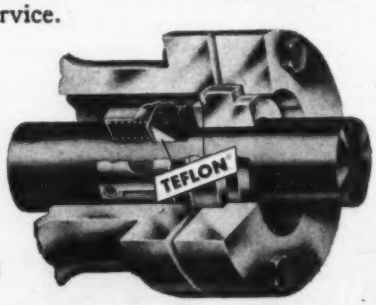

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Association News . . .

ducing supervisor in four basic points:

1. The high-producers devote their time to planning and organizing and providing leadership; while the low-producers find themselves at work on tasks that should be assigned to members of their staffs.

2. High-producers are more sincerely interested in each employee as a person, recognizing the individuality of staff members; while low-producers are interested in each worker as a "tool" only.

3. High-producers train employees for greater responsibilities through new techniques and skills; while low-producers merely teach better and easier ways without thought for the next job.

4. High-producers correct mistakes by explaining just how and why a task was done incorrectly; while low-producers correct mistakes by reprimanding and demanding that work be redone.

Presiding at the meeting was Dean W. Newell of the Philip Carey Mfg. Co. of Lockland, chairman of the Miami Valley Division.

Tappi Statistics Conference to be Held at Madison

The Tappi Conference on Statistics in the Paper Industry will be held July 10 to 23 at the U. S. Forest Products Laboratory in Madison, Wis.

The meeting will consist of two separate concurrent courses, elementary and advanced seminar. The elementary course will give training in understanding and using some of the valuable but simpler statistical techniques. The advanced course, which is to be a seminar, will give training in using the more advanced applications to those persons who already have some facility and experience in the use of statistical methods.

Enrollment in the elementary course will be limited to 40 and in the advanced seminar to 10. The conference is sponsored by the Statistics Committee of Tappi.

NPTA Elects

R. S. Johnston, chairman of the board of Old Dominion Paper Co. in Norfolk, Va., was elected president of the National Paper Trade Association at the group's 52nd annual convention held recently in New York,

N. Y. He succeeds H. A. Hartinger of Anchor Paper Co., St. Paul, Minn.

Other officers are: vice president in charge of the wrapping paper division—L. M. Murphy, president of Dillard Paper Co., Greensboro, N. C.; vice president in charge of the fine paper division—E. J. Petrequin, president of Petrequin Paper Co., Cleveland, and treasurer—C. E. Canfield, president and treasurer of Canfield Paper Co., New York, N. Y.

Paine Named to APPA Comm. Relations Group

Augustus G. Paine, vice president and secretary of New York & Pennsylvania Co. Inc., was recently appointed chairman of the community relations committee of the American Paper & Pulp Association. He will serve for two years. The purpose of the committee is to promote good relations between paper and pulp mills and the communities in which they operate. The group, comprised of top management representatives, sets policy for and coordinates the activities of 11 regional community relations groups.

Coming Events

Tappi

May 18-21—Western International Meeting of Pacific Coast Section with Pacific Coast Superintendents and Pacific Coast CPPA, Empress Hotel, Victoria, B. C.

May 23-25—Sixth Coating Conference, Statler Hotel, Cleveland

July 10-23—4th Conference on Statistics, U. S. Forest Products Laboratory, Madison, Wis.

June 9-11—Empire State Section, annual meeting, Whiteface Inn, Lake Placid, N. Y.

American Pulp & Paper Mill Superintendents Association

May 18-21—Western International Meeting of Pacific Coast Division with Pacific Coast Tappi and Pacific Coast CPPA, Empress Hotel, Victoria, B. C.

May 20-21—Pennsylvania-New Jersey-Delaware Division, Hotel Lawrence, Erie, Pa.

June 14-16—National Meeting, Netherland Plaza Hotel, Cincinnati

Other meetings

May 18-21—Third International Meeting of the Pulp & Paper Industry, Empress Hotel, Victoria, B. C.

May 24—Annual Technical Conference, APPA Committee on Coordination of Research and the U. S. Forest Products Laboratory, U. S. Forest Products Laboratory, Madison, Wis.

June 6-8—CPPA Technical Section, summer meeting, Chateau Frentenac, Quebec, Que.

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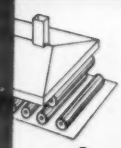

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PATENT REVIEWS

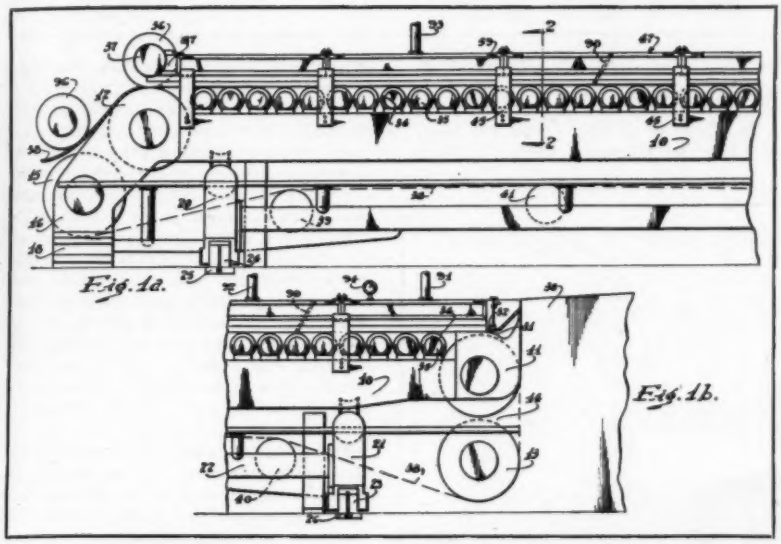


Fig. 1a.

Fig. 1b.

MELVIN NORD*

Papermaking machine

U.S. 2,684,019, issued July 20, 1954, to Harry H. Hart and assigned to Pusey & Jones Corp., relates to improvements in fourdrinier papermaking machines. The primary object of the invention is to provide means for increasing the rate and volume of the flow of white water from the papermaking stock on the foundrinier wire. This is accomplished by subjecting the papermaking stock on the fourdrinier machine to superatmospheric pressure throughout substantially its entire travel with the wire.

The pressure is applied from hoods 47, shown at the top of the fourdrinier machine in Fig. 1. Compressed air is fed to the hoods through pipes 93.

In the operation of the apparatus of the present invention, papermaking stock is discharged through the slice 31 in a uniform, rapidly moving stream extending entirely across the wire. The stock moves with the wire into the first compartment below the hood and is there subjected to superatmospheric pressure, with the result that the water in the stock, commonly termed "white water," flows through the screen at a higher rate than is conventionally the case, where the water is subjected to the force of gravity alone. As the wire travels longitudinally under the hood, it is subjected to air pressure in the next compartment, which may be greater or less than the air pressure in the first compartment. Additional moisture is drained through the wire under the influence of this pressure as the wire and the stock travel along. A certain amount of water is withdrawn by capillary attraction between the wire and the table rolls 35, and this removal of water is more effective because of the increased pressure contact between the wire and the table rolls, resulting from the air pressure in the hood, so that the capillary attraction between the rolls and the wire is increased.

The wire with the stock on it next passes over the table rolls adjacent the foot end of the machine, in the area normally occupied by the suction boxes, and additional moisture is removed by the superatmospheric pressure existing under this portion of the hood. The web passes below the lump breaker roll 36 and emerges to the atmosphere on the wire 38, where it is picked off by the takeoff roll. Pressures ranging from one ounce per square inch to a few ounces above atmosphere may be employed.

The construction of the hoods is described in considerable detail in the patent.

*Patent attorney, 17600 Pinehurst, Detroit 21.

Paper Machinery

U.S. 2,696,766, issued Dec. 14, 1954, to Donald L. Stark, and assigned to The Black-Clawson Co., provides pulping apparatus which is of sufficient size and capacity to receive the full web of "broke" and to pulp it continuously at a sufficient rate to handle the full output of broke during a web break on a paper machine. It also requires sufficiently low head room for installation in restricted spaces below a paper machine to receive the broke by gravity directly from the machine.

Method of adding extra filler to the edges of paper

U.S. 2,693,415, issued Nov. 2, 1954, to Milton O. Schur, and assigned to Ecusta Paper Corp., provides a method of avoiding the usual deficiency of filler content at the edges of a filled paper sheet produced on the forming wire of a paper machine. Controlled amounts of filter slurry are added to the pulp and filler furnish in the paper machine head box at locations adjacent to the edges of the head box in line with the edges of the paper sheet produced on the forming wire. The added filler blends with the pool of furnish in the head box, and although most of the added filler is left within the relatively narrow areas where it is introduced, no streaks are formed in the paper sheet.

Manufacture of acoustic fiberboard

Acoustic fiberboard (insulating board) can be produced by perforating wet fiber

Other Patents of Interest to the Pulp and Paper Industry

Subject	Inventor or Assignee	Patent No.	Date
Bottle loading carton	The Bradley & Gilbert Co.	2,693,297	11/2/54
Bottle carrier	Package Machinery Co.	2,693,298	"
Cap for paper cups	Seal-Kap Corp. of Delaware	2,693,307	"
Multi-compartment shipping carton	The Hinde & Dauch Paper Co.	2,693,308-9	"
Paper box construction	Diamond Paper & Box Co.	2,693,310	"
Sized paper product, size and method of making same	Bennett Inc.	2,693,424	"
Pulping machine	E. D. Jones & Sons Co.	2,693,738	11/9/54
Sheet-forming machine	Risaku Okawa et al	2,693,739	"
Control circuit for sheet feeding and stacking apparatus	Universal Corrugated Box Machinery Corp.	2,693,885	"
Carton for packing boxes in units of five	Behr-Manning Corp.	2,693,902	"
Refining apparatus for papermaking stock	The Black-Clawson Co.	2,694,344	11/16/54
Web transfer assembly	Beloit Iron Works	2,694,346	"
Suction press roll arrangement	Beloit Iron Works	2,694,347-8	"
Bottle carrier with partitions	Container Corp. of America	2,694,504	"
Box-type container carton	Gerald J. Zanck and Max W. Matz	2,694,518	"
Digester for cooking cellulose	Storviks Sulfit Aktiebolag	2,694,632	"
Method of saturating fiberboard	The Celotex Corp.	2,694,648	"
Manufacture of waterproofed multiply sheets	The Patent & Licensing Corp.	2,694,963	11/23/54
Doctor blade for coating machines	The Chapion Paper & Fibre Co.	2,695,004	"
Collapsible carrier for columnar articles	Oscar L. Vines	2,695,116	"
Shipping container	Gaylord Container Corp.	2,695,128	"

mat by a method described by Clark C. Heritage and George W. Thomas in U.S. 2,686,461. The patent is assigned to Wood Conversion Co.

Heretofore, such holes have been formed in such boards by mechanical operations on the dry board; for example, by drilling holes into the board, or by punching holes therein. Such operations are costly, particularly in the maintenance of drills or punches, which are quickly dulled by continued use. This is especially true where the board so punched or drilled is previously coated with a coating composition, such as one containing mineral pigments. Also, in punching or drilling coated dry board of which the pigmented surface is brittle or otherwise subject to chipping, the edge of the hole is frequently chipped to a noticeable degree. Such chipping renders the section unserviceable for decorative purposes, and a considerable amount of waste thus results. By use of the present invention, these problems are avoided, since the perforations are made in the wet stage.

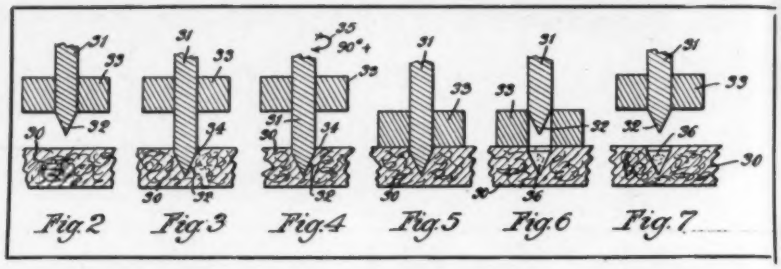


Fig. 8 is a diagrammatic presentation of the over-all process. In Fig. 2 the wet mat 30, representative of mats 21 or 23 and hence coated or not, is indicated in position about to be pierced by a pin 31 placed above it. The pin 31 is a cylindrical pin having a conical end 32. About the cylindrical portion of the pin 31 is means providing a collar, preferably as a bearing, slidable on the pin 31.

Fig. 3 shows the parts illustrated in Fig. 2 moved by action to cause the pin 31 to penetrate the wet mat 30, to an extent to bring the conical end wholly within the mat with a slight penetration at the region 34 of the cylindrical portion of pin 31. In this position, which is repeated in Fig. 4, the pin is rotated at least 90° as indicated by arrow 35.

Fig. 5 shows the parts of Fig. 4 after stopping the rotation, but with the collar 33 moved along the pin to contact the penetrated surface of the mat 30, to position the surface of the mat against uplift. Then the pin 31 is withdrawn from the mat by sliding it upward through the collar 33 as shown in Fig. 6. This leaves a clean hole 36 in the mat and an unimpaired felted structure surrounding the hole. Then the collar 33 is again moved along the pin 31, as in Fig. 7, to the original position.

In order to avoid timing operations which could include holding the pins sta-

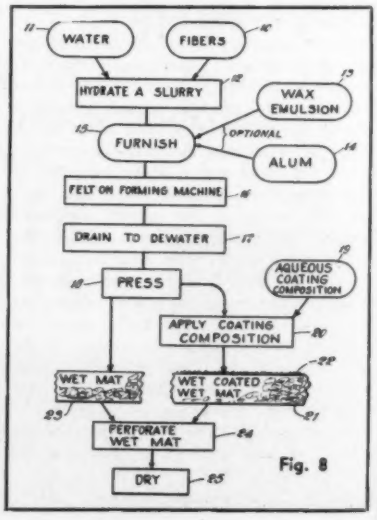


Fig. 8

tionary, rotating the pins, and again holding the pins stationary, an alternative is to have a gang of pins mounted in a device in a manner to maintain all of the pins constantly in rotation. The operation of piercing a wet mat is effected by more simple mechanisms and controls when the pins constantly rotate.

Preparation of fusible lignin resins

With the method described in U.S. 2,683,706 it is possible to produce fusible lignin resins from wood-hydrolysis lignin, lignin-sulfonic acid, sulfite cellulose waste liquor, lignite, and other lignin-containing raw materials. The inventor is Hans Friedrich Muller, and the patent is assigned to Institut International Financier of Eschen, Liechtenstein.

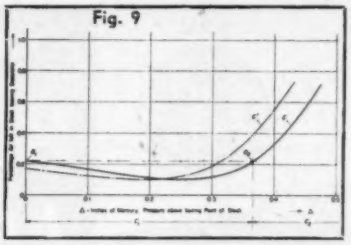
As an example of the method, 1000 grams of finely-ground lignin obtained in wood hydrolysis with concentrated hydrochloric acid (Bergius Process) is thoroughly mixed with 400 grams of sodium hydroxide and 1000 grams of water, dried in a rotary tubular kiln with a steel ball charge at 220° Centigrade wall temperature, and heated until no more water escapes and a sample of the dried mixture is readily and completely soluble in water. The dried product is stirred into 2000 c.c. of water and stirred while heating until all has dissolved. Stirring quite rapidly, 30 per cent sulfuric acid is added to the lignin solution while at a temperature between 60° and 90° Centigrade until a pH value of 3 is obtained. On precipitation, the lignin agglomerates in the solution and is fused together in the solution by further heating. The cooled lignin resin, which is separated from the solution, is then crushed and worked into a fine suspension with 350 c.c. of water. This suspension is heated to boiling point, and a purified lignin resin is thus obtained.

If it is desired to mix the lignin resin with a phenol formaldehyde resin, the process is as follows: A resin is produced by boiling 200 grams of phenol, 242 grams of 30 per cent formaline and 1 gram of sodium hydroxide for two hours. Without separating the phenolic resin from the separated water, it is stirred when cold into the said lignin resin emulsion. The mixture is then heated, the lignin modified phenolic resin separates in its fused state, and the water is removed.

If it is desired to produce a molding compound with the lignin resin described, the resin is mixed while being heated with 50 g. glycerine and 5 g. sodium hydroxide dissolved in 100 c.c. of water, pouring the hot mixture in a heated kneader charged with 900 g. wood meal, 100 g. kaolin and 20 g. magnesium oxide. Now the material is kneaded at increasing temperature until a plastic mixture is obtained.

Deaeration of a suspension of cellulosic fibers

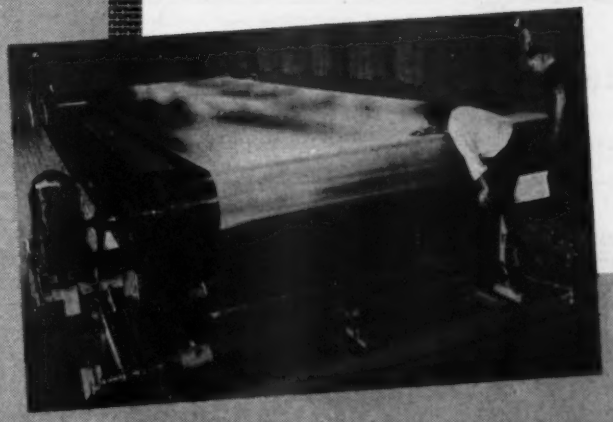
Pulp issuing from a digester or stock supplied to a papermaking machine may be deaerated by applying vacuum in a narrow critical range. The method is described by Carleton L. Clark and Carlo Vicario in U.S. 2,685,937, the patent being assigned to the Rotareald Corp.



The importance of using the proper amount of vacuum is shown in Fig. 9, in which the percentage air left in the stock is plotted against the difference between the deaerator pressure and the vapor pressure of the stock at its boiling point. The two curves represent the results with an impingement plate (curve C) and without it (curve C'). As indicated by the curves, optimum results are obtained by using a pressure not more than 0.3 in. Hg. above the vapor pressure of the stock. Reduction below this is not only unnecessary but for some reason actually is less effective.

In the practice of the invention, the dilute suspension of fibers is injected into a vacuum tank as an atomized spray or mist, which descends slowly through the atmosphere of the tank and finally collects in a pool in the bottom of the tank. The patent specification describes equipment which may be used to carry out the invention.

Two of the Men Behind Eastwood Wires



FINAL EXAM

Here James Baney and Clarence Reed are making a final, inch-by-inch examination of a large fourdrinier wire. Though this is a final check, it is only one of many given it at every stage of its manufacture, from the casting of the alloys in our own foundry to the stretching table inspection shown above.

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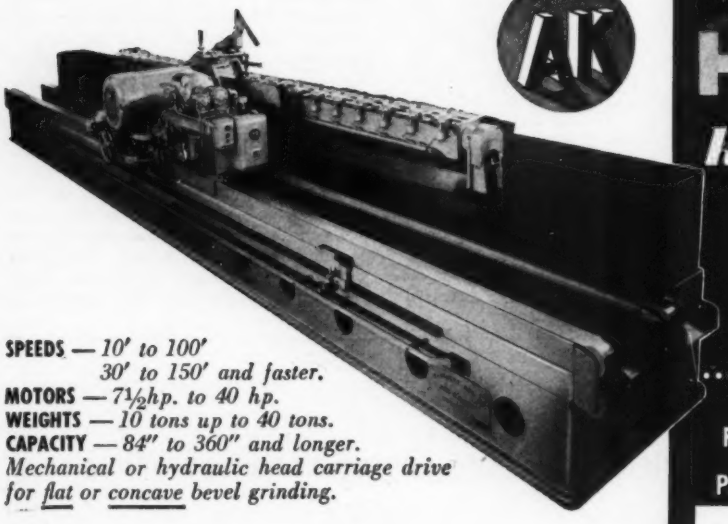

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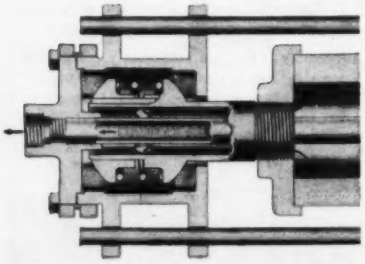
ROD-SUPPORTED TYPE

The Type LJ Johnson Joint has lugs cast right on the body to accommodate supporting rods. This design lifts the weight of the body from the rotating assembly—permits it to "float" freely inside. Joint shown at left is for syphon pipe service, has steam inlet in side of body 90° from lugs. Type LJ is also available for thru flow service.



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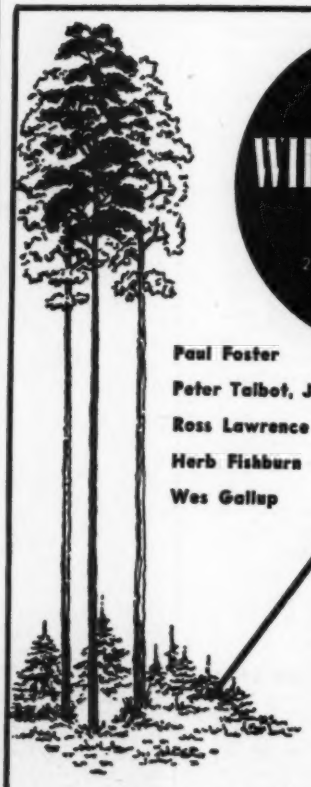

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FOREIGN ABSTRACTS

Sulfite Waste Liquor

Sample of liquor	Exp. No.	Sp. gr.	pH	Solids						
				Dry substance %	C %	H %	Ca %	S %	Ash %	Gross heating value
Fermented liquors:										*
A Na-base strong pulp	1— 4	1.087	4.5	18.2					17.9	4,305
B Na-base strong pulp	5—17	1.051	5.73	10.9				6.9	22.6	4,307
C Ca-base rayon grade	21—37	1.051	4.54	11.1	44.9	4.8	6.3	6.8	17.7	4,260
D Ca-base strong pulp	101—	1.041	4.95	8.93	42.7	4.7	6.65	6.9	19.2	4,080
E Na-base strong pulp	201—	1.060	5.05	13.32	43.5	4.6			18.8	4,390
Crude liquors:										
F Ca-base strong pulp	701—	1.043	2.53	11.0			3.9		7.7	4,195
G NH_4-base strong pulp	601—	1.047	2.20	10.55			4.9[1]		4.9	4,437

*Calories per gram

Wet combustion of sulfite spent liquors

This is a comprehensive article on the wet combustion of organic compounds, especially those of lignocellulosic origin. When dissolved or suspended in water, such compounds can often be converted completely into carbon dioxide and water by oxygen or air acting under pressure, at temperatures ranging from 190-230°C. At 225° or above, the reaction rate is quite high, and the reaction resembles a true combustion.

In the present work, the total and partial oxidations of sulfite spent liquors, peat suspensions, and city sewage sludge are all treated generally at 225°, which is the lower limit at which organic compounds from such materials can be oxidized completely.

The extensive data dealing with the distribution of organic and inorganic matter, heats of combustion of the products, thermal efficiency, etc., are given in diagrams and 16 tables. A continuous partial wet combustion of sulfite spent liquor is also discussed. The accompanying table exemplifies the type of data given by the author.

The paper is in Swedish, but all tables are in English; and there is a brief English summary. K. N. Cederquist, *Svensk Papperstidn.*, 58, 154-64 (1955).

Determination of ammonia in ammonium bisulfite liquor

Simple distillations of spent liquors containing ammonium bisulfite in the presence of an excess of caustic soda give low results, and the more slowly this distillation is carried out the greater is the error. This indicates that (with time) there is some interaction between ammonia and the organic components of the spent liquors that bind the nitrogen and prevent its quantitative recovery as NH_3.

To obviate this, the sulfite spent liquor is added to a boiling solution of caustic soda in a Parnas apparatus and, at the same time, agitated vigorously by passing steam through the mixture. Under these conditions the relative error of the determination is reduced to about −0.3 to −0.4 per cent (which is permissible for routine analyses) in contrast to errors ranging from 2.5 to 7.9 per cent, when steaming is omitted. Furthermore, the modified technique is reproducible, whereas the original reproducibility was extremely poor.

Similarly, an ion exchange technique gives very good results. In this analysis, the spent liquor is percolated through an ion exchange column filled with a strongly acid cation exchanger (13 × 200 mm.; Amberlite IR-120, particle size 0.2-0.3 mm.), washed with 200 cc. water, and then eluted with 200 cc. normal potassium chloride, followed by treatment similar to that described above (i.e., alkaline, steam distillation).

The two methods are in excellent agreement, but there is no need of introducing the ion exchange technique, since the alkaline steaming method is very good for routine control analyses. O. Samuelson and Nils-Herman Schöön, *Svensk Papperstidn.*, 57, 850-2 (1954) (in English).

Refining screenings with two hydrafiners

Acceptable pulp is obtained by refining screenings with two hydrafiners (Model 00 A, operating at 980 rpm and at 1480 rpm). Screenings concentration is first increased by a thickener, from about 0.5 per cent to 3.5-4.0 per cent, and the daily output of 90 per cent refined screenings is 3 tons, produced at 735 kwh per ton.

Despite the rather high power consumption, the author believes that this refining method is better than those formerly in use, but that this depends on local circumstances.

Bauer McNett fractionations and strength properties of the resulting pulp are tabulated. Ernst V. Lindström, *Paperi ja Puu* (*Paper and Timber, Finland*) 36, 435-6 (1954) (original in Swedish, with English summary).

Theory and practice of rosin sizing

This is the first of a series of articles on sizing emanating from the Technische Hochschule, at Darmstadt. It deals mainly with influence of the hardness of water used in making up size solutions and in manufacture.

The authors use the Zeiss Leukometer in determining the degree of sizing and in standardizing their sizing conditions. They determine the brightness of the sized sheet prior to, and after, the usual flotation test; and the ratio gives an index of the sizing degree. By the use of this procedure, the authors determine the influence of water hardness on sizing.

A small amount of calcium ion added to distilled water augments the sizing effect greatly, and the optimum results are obtained when a 35.8° U.S.A. hardness (equivalent to 2° German hardness) is

reached. Thus, water containing a certain amount of electrolyte is better suited for sizing than distilled water. Electrolytes favor rosin precipitation, and, as sedimentation experiments show, electrolytes accelerate flocculation and increase the amount of rosin sorbed by the paper sheet. However, past a certain point, the further addition of electrolytes (*e.g.*, calcium chloride) wil cause a sharp drop in sizing. This is discussed and seems coupled with differences in sedimentation rates, that caused by $CaCl_2$ being slower than that resulting from the papermakers alum. The rosin retention on the sheet is poorer when too great an excess of $CaCl_2$ is present.

By standardizing centrifugation, the degree of hydration of different rosin precipitates (formed with various electrolytes) can be determined. In a rosin size containing about 37 per cent free rosin, the per cent of hydration is greatest with alum and least with sodium chloride (which gives a precipitate only 1/15th as hydrated). Calcium chloride and magnesium sulfate are intermediate in their effects on hydration. Degrees of hydration decrease with decreasing valency of the cation but are also influenced by the nature of the anion of the electrolyte.

The addition of small amounts of ammonium chloride to water containing either alum or calcium chloride hastens the sedimentation of the rosin. When the volume of a rosin precipitate is low, a lower size yield and poorer covering of pulp fibers in the finished sheet are noted. George Jayme and Hanns Arledter, *Das Papier*, 9, 7-11 (1955) (in German).

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Approximately 90% of the pulp bleached with chlorine dioxide in plants now operating or under construction will be processed in equipment lined by Stebbins.

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Foreign Abstracts . . .

Variables in handsheet formation

Effects of the more important variables in sheet formation on strength properties are studied, using the British standard pulp evaluation technique. Only the pressure used in making these sheets has a significant effect on strength properties. In other cases, even a considerable departure from the conditions specified fails to show any marked influence. Even when the differences are statistically quite marked, they seldom have any practical importance. In the case of pressures, however, a slight deviation from standard conditions produces significant changes in the sheet strength.

The pulps studied are made by the kraft process from eucalyptus, pine and hemlock, as well as spruce sulfite. A. J. Watson, G. Farrant, and W. E. Cohen, *Australian Pulp & Paper Ind. Tech. Assoc. Proc.*, 7, 68-83; discussion, 83-4 (1953).

Isolation of lignin from finely divided wood

When sprucewood is ground in a vibrational ball mill, after dispersing in a suitable non-swelling solvent (such as toluene), and the wood is then extracted with a solvent like methyl "Cellosolve," about two-thirds of the original lignin can be removed. This so-called "milled wood lignin" is a cream-colored powder, which is less soluble than Brauns' native lignin and appears to have a somewhat higher methoxyl content and a lower phenolic hydroxyl content. The use of ultrasonics or a colloid mill does not give the same result as does the ball mill.

Details of this work will be given in future papers. Anders Björkman, *Nature*, 174, No. 4440, 1057-8 (1954) (in English).

Tropical woods from the Belgian Congo; possible uses in pulping

Two comprehensive reports, one a monograph and the other a technical article, contain the work done at the Research Laboratories of the Belgian Colonial Ministry.

In the longer monograph, 23 tropical hardwoods from the Belgian Congo are studied. The investigation includes analyses for ash, magnesia, potash, lime, and silica, ether and alcohol-benzene extractives, hot water extractives, solubility in per cent caustic soda, cellulose and alpha-cellulose, lignin and total pentosans.

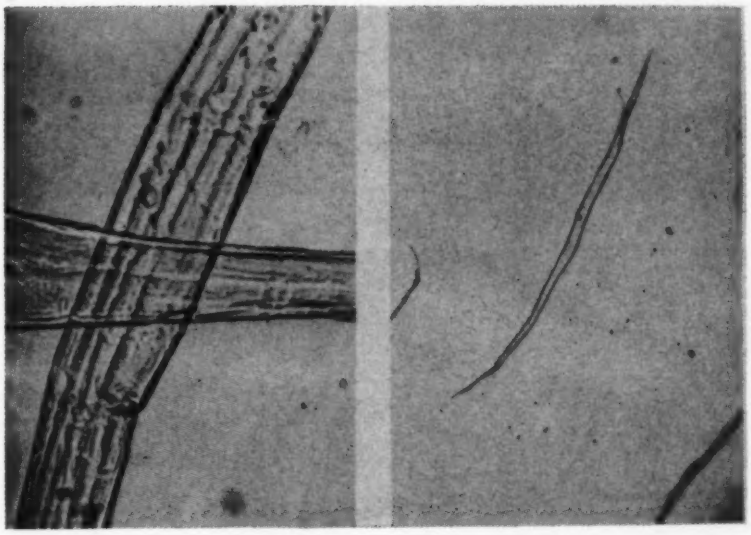
Detailed biometric studies are made on isolated wood fibers (*i.e.*, length, breadth, cell cavity and cell wall thickness). The

woods are then subjected to kraft cooks, and the chemical and physical properties of the resulting pulps are evaluated. Woods with specific gravities above 0.9 are not considered suitable for pulping, nor are those high in silica, tannins, phlobaphenes, and in certain resins.

Of all the woods under investigation in the first series, only that of the "umbrella tree" (*Musanga cecropioides*) (cf. accompanying figure) shows a folding endurance that resembles, and at times exceeds, that of Scots pine kraft. Besides the qualifications given above, the authors believe that the fibers of the tropical angiosperms can be considered suitable raw materials for sulfate pulping, provided they have fiber lengths above 1 mm. and a flexibility coefficient above 35.

In the second report, a large number of other woods, and herbaceous plants are studied biometrically. The fiber length (L), breadth (E), cell cavity (C) and cell wall thickness are determined in each case. The coefficients of flexibility (I) (equal to C/E × 100) and the felting coefficient (E/L × 100) are determined. The flexibility of the fibers and the physical properties of the resulting sheets seem to be related.

Fibers in which the coefficient of flexibility is above 75 have large cell cavities and thin walls, show good fiber-to-fiber bonding and give strong pulps. This group includes most of the Congo hardwoods with specific gravities below 0.45 and, also, certain conifers. Fibers with coefficients of flexibility between 50 and 75 also show good bonding; most of the conifers and many of the lighter and intermediate hardwoods fall into this group. The heavier hardwoods show flexibility coefficients between 50 and 30, and these do not show very satisfactory bonding properties. Finally, there is a fourth group with flexibility coefficients less than 30 which contains very thick walls. This group gives very weak pulps; many herbaceous plants also fall in this group.



Musanga cecropioides

Apparently, the shorter fiber lengths of the hardwoods of the Congo do not seem to militate against their uses in the pulp industry; other fiber characteristics are of more importance. J. R. Istas, R. Heremans and E. L. Raekelboom, *Publications de l'Inst National de l'Etude Agronomique du Congo Belge;* Tech. Series No. 43, 121 pages (1954) (in French), 118 references. The second paper is by J. R. Istas, *Landbouw kundig Tijschrift Belgisch Kongo,* 45, No. 5, 1249-1276 (1954) (in Dutch).

Sulphite Mill Acid Plants
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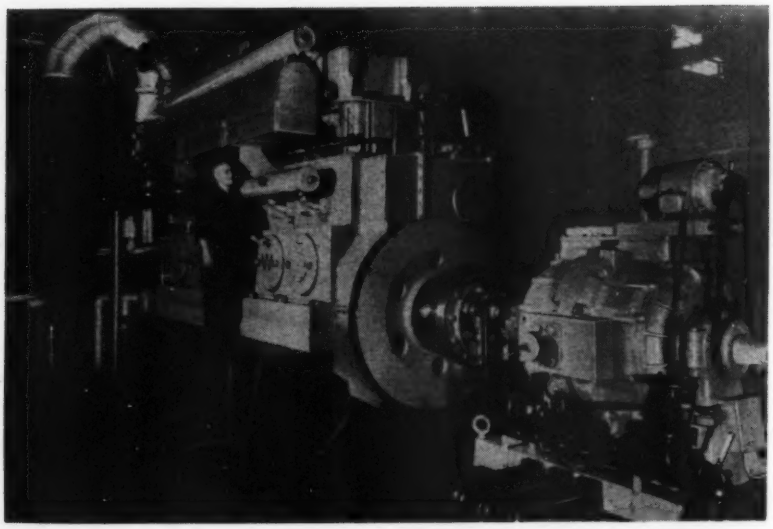

Power engines

A completely new line of high-pressure turbo-supercharged, four-cycle power engines, known as the SW 14 line, are rated from 1360 to 5000 hp at 450 rpm. Largest of the new line is a 16-cylinder V-engine which, according to the manufacturer, will develop twice as much power as present diesels of the same weight and dimensions, previously built for similar services. The tri-power arrangements permit use of the new engines as oil diesel, dual fuel diesel, or spark ignition gas.

The SW 14 engine is claimed to be the only low-speed, heavy-duty, high-pressure turbo-supercharged engine in the United States designed and built for a capacity exceeding 200 psi bmep. It is devoid of complicated turbo-charging control systems.

One of the unique features built into the new line is interchangeability of major parts between the in-line and the V-engines, such as cylinders, heads, rods, pistons, bearings, fuel injection equipment, etc.

There are many additional important features. The combustion chamber is designed to burn most efficiently the larger quantities of fuel required for the higher power output. Four valves (two inlet and two exhaust) are mounted in the cylinder head for less flow friction and higher volumetric efficiency. A symmetrical dished piston design, flood cooled for maximum strength and uniform cooling, is another major feature.

For an air supply to support complete combustion and to provide for perfect scavenging, the engine is equipped with a high-pressure turbocharger. Discharge pressure at only 8 to 10 psig permits using comparatively small air aftercooler and reduces cooling water requirements considerably below that of engines using much higher charging pressures.

Exhaust and air manifolds are on opposite sides of the engine. Cast-in water jackets are baffled for even distribution of circulating water and for high velocity cooling. Circulating water is entirely outside the engine frame, preventing electrolysis and frame corrosion and eliminating the possibility of contaminating the lubricating oil. The lubricating oil system is of the positive pressure type, with main header cast in the base and drilled passages to main bearing seatings. *Worthington Corp., Harrison, N. J.*

Portable mixed-bed demineralizer

For the production of small quantities of pure water, a compact, portable unit, the Model MBD-6A demineralizer, has been developed. The device contains a bed consisting of an intimate mixture of "Permutit Q," a cation exchanger and "Permutit S," a highly basic anion exchanger; and it is used to produce a water of low total dissolved solids, low CO_2, low silica content, and low conductivity.

In service, the inlet hose is connected to a raw water supply and the outlet connected either into a pipe line or left free to be put into any container where water is required. The faucet, to which the raw water inlet adapter is fastened, should be used to regulate the flow through the unit. Flow rate is 1 to 2 gpm maximum.

A conductivity meter is used to indicate the dissolved solids content of the effluent water and will thus show when regeneration of the exchange resins or a new refill is required. The unit has a capacity of approximately 1,500 gr. total dissolved solids. During each cycle or

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run, it is capable of demineralizing 250 gal. of raw water containing 100 ppm total electrolytes or 125 gal. of raw water containing 200 ppm total electrolytes. When the unit is exhausted, the resins may be removed, discarded and replaced with a new refill. However, the resins can be regenerated and re-used.

The conductivity meter is provided with a 4 ft. length of electric wire for attaching the meter to a conductivity cell and a 6 ft. length of wire leading to a convenient outlet for current supply. A standard 110 v., 60 cycle current supply is required. In normal service, the meter may remain connected to the power supply and cell and may be operated solely by means of a switch on the case. *Permutit Co., 330 W. 42nd St., New York 36, N. Y.*

Control valve for solids

A new type of control valve for handling solids, such as rag and paper stock, bark and wood particles, sulfate stock, bleach, starch and alum solutions, in suspension is now on the market. It can be operated either manually or pneumatically for on-off or control service.

The valve body, constructed of cast iron, is suitable for pressures up to 150 psig. Steel valve bodies are available for pressures of 600 psig and higher. Standard sleeves of pure gum rubber, reinforced with multi-ply cords, will withstand temperatures of 180°F., according to the manufacturer. Sleeves of different materials are available for high temperatures and pressures. Valve sizes range from 1 to 24 in. *Red Jacket Co., Inc., Investment Bldg., Pittsburgh 22, Pa.*

Direct flow pump

The new "Powr-Pac" pump is a 2½ in. stroke, 25 hp, direct flow triplex pump. Because of its small size, this pump is said to offer economies to users who previously have bought larger pumps than needed.

According to the manufacturer, one outstanding feature of the "Powr-Pac" is the sectionalized fluid-end design. Individual fluid-end sections are easily replaced at a fraction of the cost of the entire fluid-end, it is claimed. The pump is precision-machined throughout.

Lubrication is force feed from a crankshaft-driven lube oil pump. Main bearings are splash lubricated, and a lube oil failure cut-out switch is standard equipment.

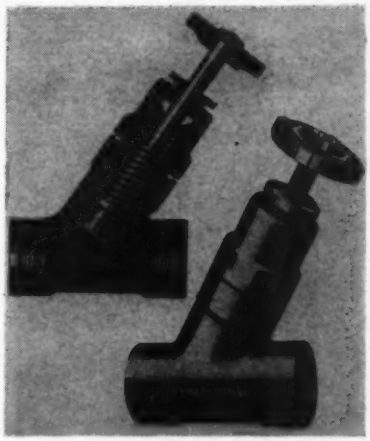
The pump is available in plunger diameters from 2½ to 11/32 in., for pressures from 390 psi to 20,700 psi, with displacement from 109.6 to 2.08 gpm. *Aldrich Pump Co., Allentown, Pa.*

Specific gravity meters

A new line of specific gravity meters for liquid solutions, mixtures and slurries has just been announced. These meters operate by comparing the pressure necessary to displace a given head of the sample liquid in a bubbler pipe with the pressure necessary to displace an equivalent head of water.

The instruments used for this purpose can be calibrated directly in terms of specific gravity, Twaddell units, degrees Baumé, or other appropriate units. They can be used for any liquid into which a bubbler pipe can be inserted. The meters are factory calibrated for the liquid in question.

The new specific gravity meters use a mercury meter body, with or without counterpoise, and a standard Bristol Series 500 recorder. The recorder can also be equipped to provide automatic control of the specific gravity, in any of five control modes. *Bristol Co., Waterbury 20, Conn.*



Completely molded polyvinyl chloride valves and fittings

The first all molded PVC valves and fittings have been announced. This line is designated as "Luncor." The outstanding feature of this line is the resistance of these valves to corrosive chemical action. The new valves resist most chemicals used in industry.

The exclusive molding process is said to give the polyvinyl chloride (PVC) material exceptional strength, protect its natural corrosion resistance and substantially reduce manufacturing costs.

Polyvinyl chloride, base material used for the new "Luncor" valve, is now availa-

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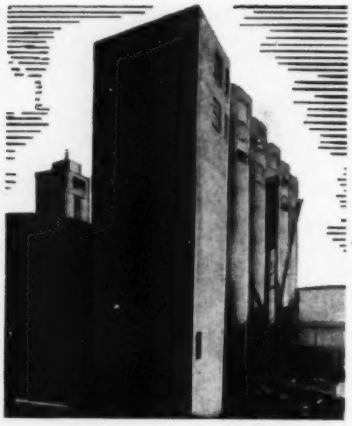

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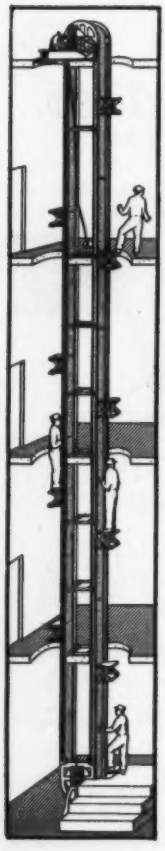

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New Products . . . . . .

ble in the form of corrosion-resistant piping. It is molded in rigid form, suitable for pressures up to 125 lb. and 150° temperature. The valve is presently available in Y-type globe design.

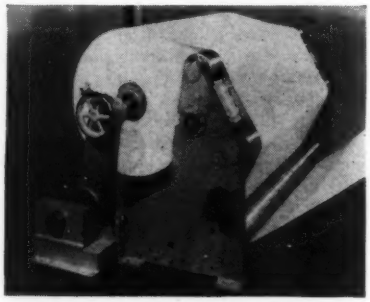
A complete line of plastic fittings made of the same material is also available. *Lunkenheimer Co., Cincinnati* 14, *Ohio.*

Packing for high peripheral speeds

A new "Teflon" yarn packing designed to function at higher peripheral speeds than ordinary braided tape or molded forms of "Teflon" has been developed. The antifrictional properties of this material combined with the softness, resilience and fluid retentive properties of fine fiber construction enables the packing to run substantially cooler than other types, according to the manufacturer.

The new packing affords all the anticorrosive, thermal, mechanical and other inherent advantages of "Teflon." It is tightly braided by means of a special process to provide density and firmness and eliminate large voids. Where some type of lubricant is required, the packing can be impregnated with fluorolube or other satisfactory lubricating material. It is especially recommended by the manufacturer for rugged and corrosive service on pump shafts and valve stems.

This packing is available in sizes ⅛ through 5/8 in., 1/16 in. gradations. *Crane Packing Co., Dept. PIC, 1800 Cuyler Ave., Chicago 13, Ill.*



Shaftless surface unwinder

The new Model 690 shaftless surface unwinder for slitters-rewinders and printing presses has been designed so as to eliminate all possible manual labor.

The hydraulic circuit is elaborate but rugged. It consists of a hydraulic pumping unit mounted on a 29-gal. tank with an output of 1000 psi at 2.8 gal. per min. This pressure is necessary to operate the hydromotor when lifting the roll off the floor and swinging it over into a vertical position.

For manual web guiding, a hydraulic cylinder is mounted below the trunnion

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shaft carrying the mill roll arms. This hydraulic cylinder is operated at 200 psi or less as required and is controlled by two push-button stations. One station is located at the main press drive station, and the other is located in the control pendant. An automatic web guide can be supplied as extra equipment.

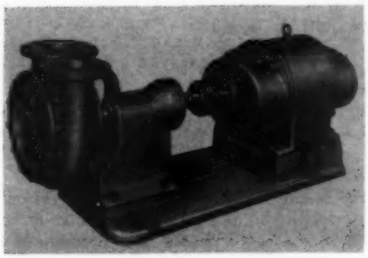
According to the manufacturer, advantages of this unwinder are as follows: very accurate constant tension; adjustable at any time by remote control; elimination of out of round mill roll effect; high speed; one man loading of mill rolls; remote side shift control; no wrinkles if baggy edge adjustment is used, and perfect splicing.

The standard machine will take a mill roll 42 in. in diameter by 60 in. wide and can be adapted to most standard core sizes up to 10 in. I.D. *John Dusenbery Co., Inc., 271 Grove Ave., Verona, N. J.*

Quick couplings for air and hydraulic hose

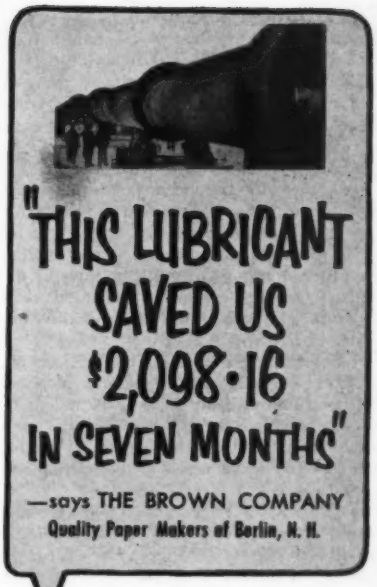
Manufactured under the trade name "Pushomatic," this complete line of quick connect and disconnect hose couplings features one-hand operation without turning or twisting to lock—just push in. The coupling automatically locks, making a high-pressure leakproof connection, according to the manufacturer, who also states that the integral check valve automatically shuts off line or hose pressure when disconnected, preventing danger of backlash or whipping. It is reported that the greater flow, full 360° swivel action and extremely small diameter of these couplings make neater and lighter hose connections.

A variety of styles and types of couplings and connecting plugs are available in sizes 1/8 through 3/4 in. Applications up to 10,000 psi are possible. The new IA Series is designed specifically for instrumentation, manifold and panel installation where space is limited. The 2A Series is especially designed for pneumatic tools, air, water and hydraulic supply lines. *Breco Div., Perfecting Service Co., 332 Atando Ave., Charlotte 6, N. C.*



Centrifugal pumps

A new line of centrifugal pumps designed especially for handling corrosive liquids and slurries was announced recently. These new pumps, designated as the Fig. 3715 Series, embody a number of significant improvements over earlier similar Goulds pumps, according to the manufacturer. They are available with the entire



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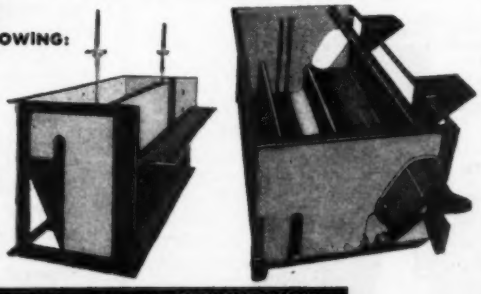

STAINLESS STEEL or MONEL SUCTION BOXES

This rigid suction box is constructed with all welded joints. It is designed to eliminate bowing or sagging giving maximum cover support. It has good depth and is easily cleaned. All supports inside of box are tapered to prevent stock build-up. Can be machined for any type of cover mounting. Furnished either in stainless steel or monel.

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STOCK TROUGHS · SAVE-ALL PANS

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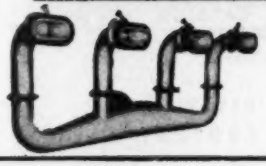

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fluid end in 316, "Gould-A-Loy 20," (proprietary name applied to a ferrous alloy bearing the A. C. I. designation CN-7-MCU) or 304 stainless steels, all iron, all bronze, bronze fitted, all iron with stainless trim, or all bronze with stainless trim.

The Fig. 3715 pumps are of support-head construction, with the support cast integral with the bearing housing. The maximum liquid temperature limitation for operation of the pump has been raised to 350° F., with provisions for water cooling of the support head and quenching of the gland. Single or double mechanical seals can be provided if desired, and they can also be quenched.

The stuffing box is on the suction side of the impeller and, therefore, is under suction pressure only. This is said to insure long packing life and keep leakage at a minimum. Wide openings in the support head provide easy access to the stuffing box and gland.

The Fig. 3715 pump is built in nine sizes, ranging from ¾ to 3 in., providing capacities up to 720 gpm and heads to 200 ft. Particular attention has been given to standardization of interchangeable parts. *Goulds Pumps, Inc., Dept. PI, Seneca Falls, N. Y.*

Sizing agent

Recently introduced to the paper industry, (see THE PAPER INDUSTRY, March 1955, p. 1199) a new chemical called "Aquapel" reacts with the cellulose fibers of paper to form strong, chemical bonds, resulting in a very hard and permanent type of sizing, or resistance to water penetration, according to the manufacturer.

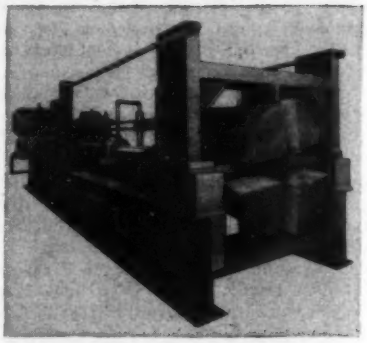
Chemically, "Aquapel" is an alkylketene dimer. In admixture with an emulsifying agent it is designated "Aquapel 380", in which form it is used as a sizing agent.

It is reported that this new size has been used successfully in a large number of mill trials where it has been applied at the size press, size tub, calender box, coater, and by spray application. It is claimed that very hard sizing can be obtained with two to six pounds of "Aquapel 380" per ton of paper.

"Aquapel" requires no alum and can be applied under either acid or alkaline conditions. Paper sized with this product shows a high degree of resistance to lactic acid solutions, alkaline solutions, and other aqueous penetrants, according to the manufacturer, who also states that this chemical presents no problem in handling broke and can be defibered in the same way as any other hard-sized paper.

"Aquapel 380" is applied as an emulsion. It is a low-melting, white solid in flake form and is easily dispersed in warm water. It may be used in most surface size compositions containing starch, glue, CMC, calcium carbonate, or colors. *Hercules Powder Co., Wilmington, Del.*

New Products . . . . . .



Hydraulic wood splitter

A new hydraulic wood splitter for processing logs too large for the chipper has a capacity of approximately one log per minute, based upon the calculation that it takes approximately 30 seconds to load the splitter with the log that is to be split. This wood splitter is equipped with a stationary ax that quarters the wood at one stroke, thus reducing the handling and number of operations to a minimum.

The all-welded base is made from structural steel. Over-all dimensions for 36 in. diameter wood 5 ft. 3½ in. long are 21 ft. in length, 5 ft. 2 in. wide, and 5 ft. 8½ in. high. *D. J. Murray Mfg. Co., Wausau, Wis.*

Hot mastic floor in colors

A new type of all-purpose floor, a hot mastic floor in five colors, designated as Ferrolite, has been introduced. Ferrolite is a hard, resilient, waterproof, monolithic, jointless-type flooring material that can be laid over practically any kind of solid base and has the ability to withstand concentrated floor loads up to 600 psi, without indentation, at a temperature of 77°F, according to the manufacturer. It is available in both standard and acid-proof types, in anti-slip or polished finishes.

Ferrolite is a hot, homogenous, "poured in place" type of mastic composition. It is spread in a uniform layer of approximately ⅜ in. thickness over a specially prepared base course or gas eliminator of required thickness. Materials are prepared for laying in the only available thermo-regulated mechanical mobile power plant in this country, specially designed for the preparation of this type of hot colored mastic composition floors.

In addition to features already mentioned, the manufacturer claims the following advantages for Ferrolite: the colors, which go all the way through, will not fade, wash or wear off; easy to clean and polish; can be used within two to four hours after being laid; will not grind, and is sound absorbing.

If the standard hardness of Ferrolite is not sufficient to meet a particular floor problem, the hardness factor can be altered by changing the composition of the mixture to fit any extreme condition. This is only possible where materials are prepared in a completely mechanical mixer. *Fulton Asphalt Co., Ferrolite Dept., 165 W. Wacker Dr., Chicago 1, Ill.*

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NEW LITERATURE

Books

"BIRKNER" DIRECTORY OF THE PAPER INDUSTRY OF EUROPE, 1954-55. Published by Birkner & Co., Darmstadt, Germany. 7 x 10. 1150 pages. DM 45 (approximately $10.75 U. S. coin). Traveller edition DM 26 (approximately $6.20 U. S. coin).

The third post war edition of this directory, which has been expanded and brought up to date, includes a map section showing the location of the pulp and paper mills in West Germany, as well as reference numbers to Part I where further details of the German pulp and paper industry are compiled.

Part I of the directory lists paper, board, and wood pulp mills in Germany; Part II lists mills of other European countries; Part III lists European exporters of pulp, paper, and paper products; Part IV lists European agents and paper mill representatives; Part V lists the products of pulp, paper, and board mills; Parts VI and VII comprise a directory of paper and paperboard converters; Part VIII deals with sources of supply of equipment and materials for the pulp and paper industry, and Part IX presents technical and economic data and statistics.

MAGNETIC CONTROL OF INDUSTRIAL MOTORS. Second edition. By Gerhart W. Heumann. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. 6 x 9¼. 714 pages. $9.50.

The many changes which have been made in the design of control components and systems since the first edition of this book was published are reflected in the new second edition, which has been brought completely up to date in line with recent advances in the electrical art.

New materials on adjustable voltage and regulating systems, particularly with regard to rotating and magnetic amplifiers, has been included; obsolete controller designs have been entirely eliminated. The reference material has been thoroughly modernized, and emphasis has been placed on the theoretical background underlying recognized National Standards and Safety Codes. Considerable attention has been given to an explanation of the rules of the National Electrical Code which apply to motor controllers.

The external performance characteristics of all types of industrial motors are discussed in the introductory chapters. The book goes on to discuss the components and devices available to the designer. Basic circuits which obtain the necessary motor performance for industrial drives are introduced. In the concluding chapters, typical controllers for general-purpose applications and selected intermittent-duty controllers are discussed. The last chapter makes general recommendations for maintenance of control equipment.

As an aid to teaching industrial control subjects, problems have been listed at the end of many chapters. These problems have been modeled on those which practicing engineers encounter in their daily design and application work.

THE MANUFACTURE OF FIBRE BOXES By A. W. Werner. Edited by Harry J. Bettendorf. Published by Board Products Publishing Co., 228 N. La Salle St., Chicago 1, Ill. 8¾ × 10¾. 184 pages. $7.00 domestic; $9.00 foreign.

This completely revised and enlarged edition of "The Manufacture of Fibre Shipping Containers" contains new chapters on Plant Layout, Roll Stock Storage, Boiler or Heating Plant, Waste Handling, Conveyorizing, Maintenance, and other subjects. Chapters of the older edition that have been completely revised and brought up to date include the following: Requirements and Styles, General Specifications, Paperboard; Adhesives, Waterproofing and Coatings; Closures, Solid Fibre Machinery, Corrugated Machinery, Scheduling Orders for the Double Cut-Off, Corrugated Creasing Wheel Contour Design, Tests, Relationship of Tests, Samples and Allowances, and The Salesman.

Added as an appendix is the book, "High-Speed Production of Corrugated Boxes," which was formerly published as a separate book. Another addition to this revised edition is a Bibliography and References section containing hundreds of references to associations, classifications and regulations, directories and guides, literature, and trade publications.

Booklets and Pamphlets

THE MECHANO-CHEMICAL PROCESS FOR PRODUCTION OF PULP FROM STRAW, BAGASSE AND OTHER VEGETABLE FIBERS. Published by Parsons & Whittemore-Lyddon Organization, 250 Park Ave., New York 17, N. Y. 7 x 9. 26 pages. The mechano-chemical process for pulping straw, sugar can bagasse, grasses and other agriculture residues is outlined in this booklet. The publication gives a short history of the experimental laboratory work, by Drs. Lathrop and Aronovsky of the U. S. Department of Agriculture, leading to the final engineering design of the process, and a detailed summary of its unique advantages, together with three simplified flow charts. Included in the booklet is a report of the world-wide marketing picture, the patent situation, and the findings of the research and pilot plant where the system was perfected. Samples of seven different papers are given, illustrating products of these blended pulps, using bagasse, wheat straw, and wood pulps.

HOW DO COSTS COMPARE FOR DRYING? (Bulletin No. 100). By G. R. Van Kampen. Published by Red-Ray Mfg. Co., Inc., 318 Cliff Lane, Cliffside Park, N. J. 8½ x 11. 4 pages. Reprinted from *Industrial Gas* magazine, this article presents a factual report on comparative costs using steam, electricity and gas for drying.

NORTHERN HARDWOODS CULL MANUAL (Bulletin No. 31). By Savel B. Silverborg. Published by State University of New York College of Forestry, Syracuse 10, N. Y. 5¼ x 7¾. 45 pages. 75 cents. The information in this manual represents average cull deductions for hardwoods in the Adirondack region of New York State. Sections of the booklet cover heartrots, cankers, seams, butt scars, butt bulges, stem bulges, rotten branches, and burls, with

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photographs of each. Specific control measures for heartrots and cankers are discussed. Cull deductions for various outward signs are summarized in a table.

A GUIDE TO CAREER OPPORTUNITIES IN THE PAPER INDUSTRY. Published by the American Paper & Pulp Association, 122 East 42nd St., New York 17, N. Y. 5¾ x 9. 80 pages. For the benefit of young people planning careers, the paper industry is described and job-classified in this booklet prepared by Beloit College, Beloit, Wis., under grant from Beloit Iron Works.

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New Literature . . .

Paper's vital role in the American economy is discussed in Part I. One section of the monograph is devoted entirely to job descriptions. The material is for the guidance of students who plan to complete college, university or technical education.

CAST STAINLESS ALLOYS DATA SHEETS. Published by Alloy Casting Institute, 32 Third Ave., Mineola, N. Y. 9 x 11½. 26 pages. These 13 new data sheets cover the properties of all the more popular grades of alloys used for corrosion resistant (stainless steel) castings. Each data sheet lists chemical compositions, physical properties, and mechanical properties, and includes a discussion of design considerations. The alloys are fully described with respect to metallurgical structure and characteristics, and preferred heat treatments are recommended. The general industrial fields of application are listed, together with the various corrosives in which each grade has been successfully employed.

A NEW WORLD OF CHEMISTRY (FILM). Produced by Reichhold Chemicals, Inc., 525 North Broadway, White Plains, N. Y. 27 minutes. Color and black and white. This film depicts the manufacture of synthetic resins and the infinite variety of their application to everyone's daily life. It shows the manufacturing processes whereby chemical reactions create the resins which are a new form of matter. Time lapse photography is employed to show how some of the manufacturing steps are taken. Scenes in synthetic resin plants in all parts of the United States are included. In one scene resins which increase the wet strength of paper are explained.

Manufacturers' Publications

Through the co-operation of manufacturers and suppliers, THE PAPER INDUSTRY *lists the following catalogues, bulletins and booklets. They may be obtained without cost or obligation, unless otherwise specified, by writing direct to the manufacturers. Please direct requests on your company letterhead.*

Strapping & Strapping Tools. A. J. Gerrard & Co., Dept. PI, 1950 N. Hawthorne Ave., Melrose Park, Ill.—This new brochure on "Bulkbinder" heavy-duty steel strapping, strapping tools and accessories contains complete descriptions and how-to-order information on tensioning tools, sealers, seals, cutters, strapping, accessories and combination units.

Process Instrumentation. Fischer & Porter Co., Dept. PI, Hatboro, Pa.—Catalog 1 contains illustrations, descriptions, and basic specifications of Fischer & Porter's complete line of process instrumentation.

Nitroparaffins. Commercial Solvents Corp., Dept. PI, 260 Madison Ave., New York 16, N. Y.—This technical data sheet gives a description and shows industrial applications of the various nitroparaffins.

Manufacturing Developments. J. O. Ross Engineering Corp., Dept. PI, 444 Madison Ave., New York 22, N. Y.—"Some of the Newer Major Manufacturing Developments in Which Ross Engineering Has Played a Prominent Part" is the title of a new 12-page brochure. Two recent installations in the pulp and paper industry are described.

Eleven Publications for Papermakers

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Pulp and Paper Volume II	15.00
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Principles of Management	6.50
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Notes and Observation on Beaters	1.00
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Pulp Bleaching (A Symposium)	.50
Technology of Papermaking Fibers	.50

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Concrete Stave Storage Bins. Neff & Fry Co., Dept. PI, 250 Elm St., Camden, Ohio—An engineer's brochure on concrete stave storage bins (silos) will be sent upon request to recognized engineers only, as the edition is limited.

Tachometers. Herman H. Sticht Co., Inc., Dept. PI, 27 Park Place, New York, N. Y.—Tachometer Bulletin No. 1046 shows in condensed form five different kinds of tachometers.

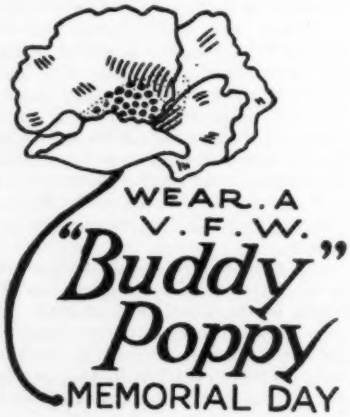
Recorder. Bailey Meter Co., Dept. PI, 1050 Ivanhoe Rd., Cleveland 10, Ohio—A new receiver recorder for pneumatic and electric transmission systems is explained in detail in a 12-page brochure (Product Specification E12-5) containing illustrations, application, operation, engineering and ordering specifications.

Shower Pipes. Emerson Manufacturing Co., Div. of John W. Bolton & Sons, Inc., Dept. PI, Lawrence, Mass.—This 6-page bulletin which describes Emerson shower pipes includes a cutaway drawing and charts showing materials used in shower pipe components, capacities of spray nozzles in gallons per minute, and length of sprayed surface for the various pipe sizes.

Valve & Fittings. Lunkenheimer Co., Dept. PI, Box 360, Cincinnati 14, Ohio—Circular 601, containing 4 pages, describes and illustrates the first all-molded polyvinyl chloride valve and fittings, designated as "Luncor."

Wax Sizes. Nopco Chemical Co., Dept. PC, Nopco Chemical Co., Harrison, N. J.—Two grades of wax sizes, the 1055 and 1155 Series, are described in a new booklet, which contains charts listing the physical and chemical properties of the individual sizes in each series, their uses and suggested applications.

Scale & Sludge Removal. Dowell Inc., Dept. PI, P. O. Box 536, Tulsa 1, Okla.—"A Solution to the Problem of Deposits in Piping Systems" is the title of a new 4-page bulletin describing the three principal methods used by Dowell in cleaning lines. Advantages are listed, as well as case histories.



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that is being added in its dry powdered form to water under agitation in pulpers or beaters before adding pulp.

0.5% on dry fibre weight — effective all types of furnish.

It's chemical hydration by the pound.

For details, see page 235 of Paper and Pulp Mill Catalogue, 1954-55 Edition.

THE BURTONITE CO.

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"Better Products . . . Through Research"

FILTER BEDS CLOGGED?

Soak them clean in half an hour!

Here's how one large paper mill saves time, and money all in one operation by using the Oakite modern cleaning method. Their filter beds hadn't been cleaned in years—and for good reason. Last time it had taken four men one full day to dig out and refill the one-story deep 14 x 18 sand beds.

Then the Oakite Technical Service Men suggested a way to restore the beds' filtering efficiency with a fraction of the previous work and expense.

Instead of digging out the beds, they were simply drained and treated with a solution of Oakite Composition No. 45. The results were immediate. When the units were flushed, the Oakite solution carried away the entire five-year accumulation of "crude", and left the sand, clean and pure once again, at peak filtering efficiency. Total savings in time and material: $300! Another example of why it always pays to consult Oakite *first*.

Call your Oakite Man today for a free analysis of *your* cleaning problems, large or small. And for some further valuable tips on paper mill cleaning, send for your copy of Booklet F-4647. Write Oakite Products, Inc., 74 Rector Street, New York 6, N. Y.

SPECIALIZED INDUSTRIAL CLEANING

OAKITE

TRADE MARK REG. U.S. PAT. OFF.

MATERIALS • METHODS • SERVICE

Technical Service Representatives in Principal Cities of U. S. & Canada

MARKET QUOTATIONS

RAGS (Domestic)

NEW RAGS

The following are quotations to mills, f.o.b. New York: per cwt.

No. 1 White Shirt Cuttings	14.50 to 15.00
New Unbleached Muslins	16.50 to 17.00
Fancy Shirt Cuttings	7.50 to 8.00
No. 1 Percales	7.00 to 7.50
No. 1 Washables	3.00 to 3.25
No. 1 Light Silesias	8.00 to 8.50
No. 1 Light Prints	6.00 to 6.25
Light Flannelettes	8.00 to 8.50
Cottonades	3.75 to 4.00
Blue Overalls	8.00 to 8.50
Blue Cheviots	7.75 to 8.25
Canton Flannels, Bleached	11.50 to 12.00
Canton Flannels, Unbleached	11.50 to 12.00
Osnaburg Cuttings	10.00 to 10.50
Underwear Cuttings, Bleached	16.00 to 16.50
Underwear Cuttings, Unbleached	16.00 to 16.50
Khaki Cuttings—	
Sun Tan	6.75 to 7.00
Mixed	3.75 to 4.00
Linen Cuttings—	
American	7.50 to 8.00
White	13.00 to 14.00
Grey	13.00 to 14.00

RAGS (Domestic)

OLD RAGS

Quotations to consuming mills, dollars per hundred pounds, f.o.b. New York, follow:

	per cwt.
Roofing	
No. 1	1.35 to 1.45
No. 2	1.10 to 1.15
No. 3 and 4	.80 to .90
Twos and Blues—	
Repacked	2.25 to 2.50
Thirds and Blues—	
Repacked	2.00 to 2.25
Miscellaneous	1.65 to 1.85
Whites, No. 1—	
Repacked	3.75 to 4.00
Miscellaneous	3.25 to 3.50
White, No. 2—	
Repacked	2.75 to 3.00
Miscellaneous	2.25 to 2.50

RAGS (Foreign)

ex dock New York City

NEW RAGS

per cwt.

Nominal:
- New Dark Cuttings
- New Mixed Cuttings
- New Light Silesias
- Light Flannelettes
- Unbleached Cuttings
- New White Cuttings
- New Light Oxfords
- New Light Prints

RAGS (Foreign)

ex dock New York City

OLD RAGS

per cwt.

Nominal:
- No. 1 White Linens
- No. 2 White Linens
- No. 3 White Linens
- No. 4 White Linens
- No. 1 White Cottons
- No. 2 White Cottons
- No. 3 White Cottons
- No. 4 White Cottons
- Extra Light Prints
- Ord. Light Prints
- Med. Light Prints
- Dutch Blue Cottons
- French Blue Cottons
- French Blue Linens
- Checks and Blues
- Linsey Garments
- Dark Cottons
- Old Shopperies

ROPE and BAGGING

f.o.b. and ex dock New York City

	per cwt.
Gunny No. 1—	
Foreign	5.50 to 6.00
Domestic	5.50 to 6.00
Wool Tares—	
Light	5.50 to 6.00
Heavy	5.75 to 6.25
No. 1 Scrap Bagging	4.50 to 5.00
Manila Rope—	
No. 1 large	5.25 to 5.50
No. 1 small	4.25 to 4.50
Sisal Rope—	
No. 1 large	4.75 to 5.00
No. 1 small	4.25 to 4.50
New Burlap Cuttings	5.75 to 6.25
Jute Threads—	
Foreign (Nom.)	6.00 to 6.25
Domestic	6.25 to 6.50
Strings—	
No. 1 sisal	4.75 to 5.00
No. 2 sisal	4.25 to 4.50
Soft jute	4.75 to 5.00
Mixed	2.50 to 2.75

WASTE PAPER

The following are quotations, dollars per ton, for No. 1 packing f.o.b. New York:

	per ton
Shavings—	
Hard White Env. Cuts.	125.00 to 135.00
Hard White No. 1	100.00 to 105.00
Soft White, one-cut	75.00 to 80.00
Soft White, No. 1	60.00 to 65.00
Coated Soft	40.00 to 45.00
Fly Leaf No. 1	25.00 to 30.00
Fly Leaf, Woody No. 1	25.00 to 30.00
No. 2 Mixed Col. Woody	20.00 to 25.00
Flat Stock—	
No. 1 Heavy Books and Magazines, Repacked	22.00 to 24.00
Mixed Books	16.00 to 17.00
Ledger Stock—	
No. 1 White	55.00 to 60.00
No. 1 Mixed (Colored)	35.00 to 45.00
Manilas—	
New Env. Cuttings	70.00 to 75.00
New Cuts, One-Cut—	
Extra Manilas	19.00 to 20.00
Manila Tab Cards, Free of Ground Wood	85.00 to 95.00
Colored Tab Cards	60.00 to 65.00
Kraft—	
New Envelope Cuttings	65.00 to 70.00
Tripled Sorted No. 1 100%	40.00 to 45.00
No. 1 Old Assorted	27.50 to 32.50
News—	
White Blank	65.00 to 70.00
Overissue	26.00—
No. 1 Folded	20.00—
Old Corrugated Containers	22.00—
New Jute Corrugated Cuts	27.00—
Mill Wrappers	18.00—
Box Board Chips	11.00—
No. 1 Mixed Paper	10.00—

CHEMICALS

f.o.b. shipping point

Alum (Papermakers)—	
Lump, cwt.	5.05—
Ground, cwt.	4.30—
Powdered, cwt.	5.10—
Blanc Fixe—	
Pulp, bulk, ton	100.00—
Dry, barrels	105.00—
Bleaching Powder—	
Drums, cwt	5.00 to 6.00
Casein (Domestic Standard) 20-30 mesh (bags), lb. 80-100 mesh (bags), lb.	27.00—
Argentine, lb.	22.00 o 22.50
China Clay—	
Domestic Filler	
Bulk (mine) ton	10.50 to 16.00
Domestic Coating	
Bulk (mine) ton	17.00 to 25.00
Imported (ship side)	
Bulk (lump) ton	20.00 to 30.00
Chlorine—	
Tank cars (wks) cwt.	2.93—
Gelatine (silicon), lb.	1.25 to 1.35
Glyc. (C.P.) drums, lb.	.29½ to .30
Litharge, powd. bbl. lb.	.16½ to .17

MARKET QUOTATIONS

Rosin (Gum)— New York, per 100 lbs.
E ..... 9.10—
F ..... 9.10—
G ..... 9.10—
WW ..... 9.35—
Rosin (Wood), carlots, F.O.B. South .... 5.75—
Salt Cake—
Dom. bulk (wks) ton 26.00 to 28.00
Imp. bulks on dock— (Atl. ports) ton (Nom.) ..... 22.00—
Soda Ash—
Bulk (works) cwt... 1.35—
Paper bags, cwt..... 1.70—
Soda (Caustic)—
Solid drums, cwt.... 3.85 to 4.50
Ground and flake, drums, cwt..... 4.25 to 5.00
Sodium Silicate—
60 deg. 55 gal. drums, (works) cwt..... 1.60 to 1.70
40 deg. 35 gal. drums, (works), cwt..... 1.35 to 1.40
Starch—
Pearl, 140 lb. bags, cwt. ..... 7.14—
Pearl, barrels, cwt... 7.14—
Paper (Sp.) bags, cwt. 7.14—
Powdered, barrels, cwt. 7.35—
Sulphur (Crude)
(Mine) bulk, long ton 26.50 to 28.00
Talc—
Dom. 100 lb. bags (mine) ton ..... 25.00 to 28.00
Canadian ..... 35.00 to 45.00
Titanium Dioxide—
Barium Pig, bbls., lb. .22½ to .23
Calcium Pig, bbls., lb. ..... .22½ to .23
Zinc Oxide, bags ..... 13.50 to 15.50

WOOD PULP

Quotations on domestic and Canadian wood pulp, dollars per short air dry ton, delivered consuming mills including basic freight allowances, follow:

Bleached Sulphite ....145.00—
Bleached Sulphite, Canadian .....145.00—
Unbleached Sulphite ...120.00—
Unbleached Sulphite, Canadian .....125.00—
Bleached Soda .....142.00 to 142.50
Bleached Soda, Canadian.142.00 to 142.50
Kraft Bleached .....147.00 to 150.00
Kraft, Bleach., Hardwood .....145.00—
Kraft, Bleach., Southern.150.00—
Kraft, Bleach., Canadian.150.00—
Kraft, Unbleached, Northern .....132.50—
Kraft, Unbleached, Southern .....115.00—
Kraft, Unbleached, Canadian .....110.00 to 115.00
Kraft, Semi-Bleached, Southern .....130.00 to 135.00
Sulphite Screenings .... 72.50—
Sulphate Screenings .... 67.50—
Groundwood ..... 82.50 to 87.50

Quotations on imported wood pulp, dollars per short ton, on dock American Atlantic ports with varying freight allowances, follow:

Bleached Sulphite, Swedish .....142.50—
Bleached Sulphite, Norwegian, freight allowed.142.50—
Bleached Sulphite, Finnish, freight allowed.142.50—
Unbleached Sulphite, Swedish .....125.00—
Unbleached Sulphite, Finnish freight allowed..125.00—
Kraft, Unbleached, Swedish, freight allowed..110.00 to 115.00
Kraft, Unbleached, Finnish, freight allow.110.00 to 140.00
Kraft, Bleached, Swedish, on dock....147.50—
Kraft, Bleached, Norwegian .....147.50—

PAPER

Quotations are mill quotations New York City

Boards—

Prices per ton, delivered in New York, 10 tons or more:

Plain chip ..... 85.00—
News vat lined chip ... 90.00—
.009 chip, rolls ..... 90.00—
Filled news ..... 80.00—
Solid news ..... 85.00—
White vat lined chip..125.00—
Chip tube and can stock.100.00—
Single manila lined chip.140.00—
Single jute lined chip..125.00—
Kraft liner .....117.50 to 122.50

White patent coated:
.020 .....155.00—
.018 .....157.50—
.016 .....160.00—

Book Paper f.o.b. New York— per cwt.

Machine coated, two sides
70 lb. No. 2 enamel; 25x 4 cases $17.25
38-500, trimmed 4 sides. Carloads $16.30
45 lb. enamel, 25x38-500, 4 cases $13.05
trimmed 4 sides..... Carloads $12.10

Uncoated
55 lb. No. 2 offset, 25x38 4 cases $14.80
500, trimmed 4 sides.... Carloads $13.85
50 lb. A Grade English Finish, 25x38-500, un 4 cases $14.05
trimmed ..... Carloads $13.10
20 lb. envelope, 17x22-500, untrimmed ..... Carloads $12.40
16 lb. tablet, 17x22-500 ..... Carloads $11.35

Rag Content Bond—
(White, 5,000 to 10,000 lbs., basis 16 lb.)
100% rag..... 58.80—
75% rag..... 45.45—
50% rag..... 36.20—
25% rag..... 29.70—

Rag Content Ledger—
(White, 5,000 to 10,000 lbs.)
100% rag..... 58.80—
75% rag..... 45.45—
50% rag..... 36.20—
25% rag..... 29.70—

Sulphite Bond—
(White, 5,000 to 10,000 lbs., basis 16 lb.)
No. 1..... 19.85—
No. 2..... 19.15—
No. 4..... 17.45—

Sulphite Ledger—
(White, 5,000 to 10,000 lbs.)
No. 1..... 20.20—
No. 2..... 19.50—
No. 4..... 17.90—

News delivered in New York— per ton
Rolls, Standard (Contract) .....125.00 to 126.00
Rolls (Spot) ..... (Nominal)
Sheets .....138.00—

Tissues (Carlots) f.o.b. New York— per ream
White No. 1..... 1.75—
White No. 2 ..... 1.35—
Bleached Anti-Tarnish.. 2.20—
Colored ..... 2.00—
Anti-Tarnish Kraft .. 1.65—
Manila ..... 2.00—
Napkins, semi-crepe (12½ lb. to M shts.) per cs. ..... 1.00—
Napkins, full crepe and embossed (12½ lb. to Mshts.) per cs. .. 1.00—
Toilet, Bleached (M shts.) per cs..... 9.35—
Toilet, Unbleached (M shts.) per cs. .. 7.90—

Towels f.o.b. New York— per case
Bleached ..... 6.80—
Unbleached ..... 5.90—

Wrappings (Kraft) f.o.b. New York— per cwt.
(Basis 50 lb. & heavier)
Standard wrapping .... 8.25—
Butchers, counter rolls.. 8.50—
Standard bag, mill rolls. 7.75—
Shipping sack, mill rolls. 8.00—
Gumming, mill rolls.... 8.25—
Asphalting, mill rolls...8.00—
Envelope, mill rolls.... 9.50—

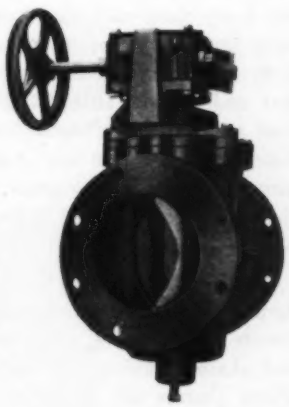
DeZURIK VEE-PORT VALVES

FOR PRECISE THROTTLING AND UNIFORM STOCK FLOW

YOU CAN SET A DeZURIK VEE-PORT VALVE at any point desired . . . . from wide open to minimum flow . . . . yet the diamond shaped orifice retains exactly the same shape . . . . the flow rate is constant at each setting!

It's the ideal valve for throttling service on pulp and paper stock lines. The rate of discharge remains constant at any setting — there is no build-up of stock in the orifice . . . . no "eddy point" where stock can pack. This stable operation results in extremely accurate control.

DeZurik Vee-Port Valves provide decided advantages on refiner systems, pump discharge lines, and other points where production and quality depend upon delivery of a steadfast, uniform volume of stock.



DeZurik Vee-Port Valves are available in sizes 3" thru 16", in a broad range of materials. Lever and gear operators can be furnished to provide dead-tight shut-off where required. Positioning type cylinder operators are available for automatic level control, stock feed to fan pump, basis weight or caliper control and similar services.

Write for complete data.

DeZURIK SHOWER CO.
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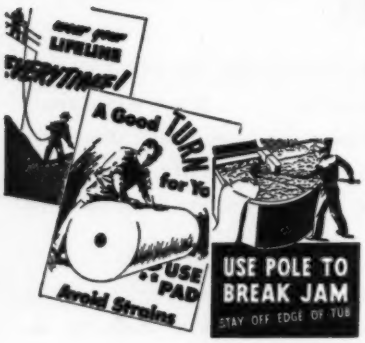
— A POTENT SAFETY TOOL



Posters should be one of the top aids in your safety program. No other safety medium can reach your entire audience—not once, but many times each day—with such low-cost safety messages. They are directed at the worker acts and worker attitudes that lead to accidents. Posters lend *timeliness, repetition and continuity* to your safety program . . . the three fundamental principles of direct selling.

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Write for a free copy of the Directory of Occupational Safety Posters. This 72 page catalog illustrates 744 posters, indexed and classified for specific operations.

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. . . contents of round tanks?

. . . speed table for beater rolls?

. . . friction of stock in iron pipes?

. . . weight of pulpstones?

. . . symptoms of causes of motor troubles and how to remedy them?

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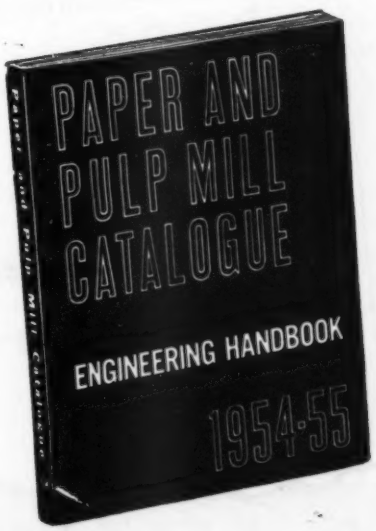

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for complete process instrumentation

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Like other leading companies, the New York & Pennsylvania Company, makers of fine book and specialty papers, found that Fischer & Porter offered them integrated instrumentation and control systems — *all from a single source.*

Converting their Johnsonburg, Pa., mill from batch-type stock preparation to continuous automatic stock preparation called for five separate blending systems feeding five separate paper machines, plus a complete refiner control system — all integrated into one centralized control station. And to get the jump on competition, the N.Y. & Pa. Co. had F&P do a complete conversion all in one fell swoop!

Write for details on the F&P Ratographic* miniature pneumatic recorder-controller, offering 4-inch strip chart record.
*T.M., F&P Co.

From one source, the N.Y. & Pa. Company obtained the engineering experience and know-how to design and instrument the system, the specialized meters (e.g., Ratosleeve* stock meters) and valves (e.g., Ratogate* stock valves) and instruments (all of F&P design and manufacture) to control the processes, and the complete panel fabrication right down to the last graphic symbol.

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complete process instrumentation

FISCHER & PORTER CO.

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LQ600

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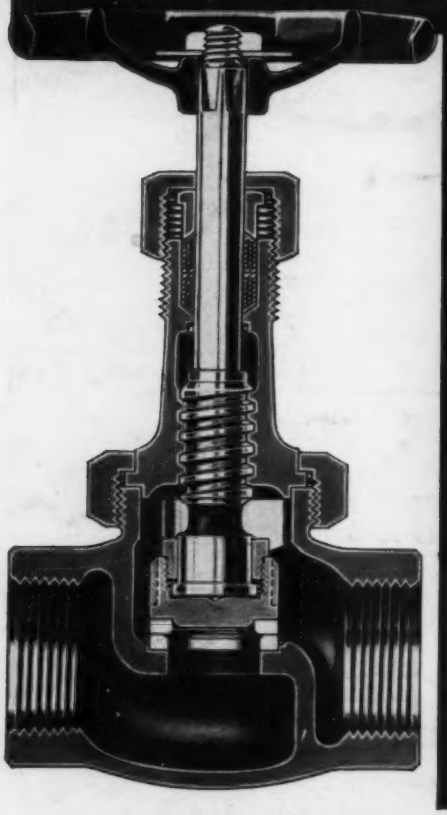

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